THE RAILWAY REVIEW

No. 43 OCTOBER 24, 1896. XXXV.

Wilhelm & Jonathan.—Germany has determined to cultivate more friendly relation with this country, and as a preliminary six enormous ships are being built in Germany for the promotion of trade with this country. The length of the new steamers is 525 ft. between perpendiculars, or 550 ft, over all; beam, 60 ft., and depth, 34 ft.; their tonnage 10,000 tons register, and their displacement approximately 20,000 tons, with a draft of 28 ft. The cargo space, including the steerage decks, shows a capacity of 11,000 cubic meters, or about 10,000 tons measurement,and the cabins contain accommodation for 100 first-class passengers and 76 second-class passengers. Two thousand, three hundred passengers in all can be carried on the steerage decks when not needed for cargo. In order to meet these conditions a rearrangement of the ordinary plan of ship construction was found to be necessary. For the purpose of separating cargo and passengers the cabin accommodations have been placed in a superstructure amidships, containing practically three stories or tiers, leaving ample space fore and aft for the handling of cargo through eight large hatches, provided with sixteen hydraulic cranes. The staterooms, saloons and general accommodations for the cabin passengers are of the most comfortable and elegant description, all the latest improvements being introduced. All of the compartments are ventilated according to approved modern principles. The vessels are built with four steel decks.

Elasticity of Air.—The elasticity of air when used in a direct acting hoist is well known and is many times an advantage. In a well made hoist, properly cared for, the lowering of the load due to leakage is not sufficient to cause trouble. A uniform load may be held usually for several minutes at any point without perceptible drop. If it is desired to hold the load for a longer time this may be accomplished by raising the piston to the top of the stroke, and leaving the air pressure on; or by adjusting a slipping or pinching collar on the piston rod the load may be held by air pressure at any point. The raising of the load when pouring metal, due to expansion of air in the cylinder, is generally an advantage, obviating the necessity of hoisting the ladle, as it empties by opening the valve. If the rise is too great a little air may be released. For certain special duties some hoists have been equipped with automatic release valves; others with slides and valves which automatically open for the admission of air to compensate for leakage and for the release of air when the load rises. An automatic means for closing valve at top of stroke is serviceable in saving air and is assumed in the calculations in this paper.—[Engineering Mechanics.

Iron Pierced by Hailstones.—One is justified in many cases in giving only a tentative belief to many of the big hailstone tales over which some travelers delight to spread themselves, says the St. James Budget. A correspondent in Dholi, Behar, however, sends the indubitable proof of photographs to quite convince us and our readers of the terrible nature of the hailstorm which occurred in his district recently. The storm passed over the greater part of the districts of Mozufferpore and Durbungah, but but it appears to have concentrated itself with special fury over the indigo factory called Dholi. Here the storm was terrific, even for tropical regions, the hailstones weighing as much as five ounces. On an average they were as large, if not larger, than cricket balls. It can be easily understood that the damage done was great. Not a whole tile was to be found in the roofs, trees were uprooted, birds were killed, and general destruction wrought all round. What is more astounding, the corrugated iron roofing over many of the factory buildings was riddled as if it had been shelled by a battery. We can quite imagine, as our correspondent informs us, that no storm like it has ever occured in the district. Hailstorms have, however, had the same terrific force in Africa, a sample of corrugated iron pierced in like manner having been recently shown in London.

Apprentices in the Paint Shop.—In the proceedings of the Locomotive and Car Painters' Association published in the Railroad Car Journal the following concise statement of apprenticeship in paint shops is made by Mr. F. S. Ball: "In my opinion the number of apprentices in the paint or any other shop should be limited only by the capacity of the shop and the opportunities afforded for the proper instruction of the apprentice, and permit me here to ask, are we, as master painters, doing all our duty in this direction to the rising generation? The opportunities for boys to learn a trade in this country have for years been limited, and are growing beautifully less since the adoption of the piecework system. Their only chance seems to be in the few trade schools that have lately sprung into existence. This, to my mind, is an injustice to the American youth, and not that alone, but an injury to the country. While we have stopped educating our boys in mechanical trades, other countries, notably Germany and Prussia, are securing to their youth all the advantages of trade instruction, and as the ranks of American mechanics become depleted by reason of age and death, we are forced to depend upon those countries, who have a surplus of skilled workman, to supply the loss, and these aliens, in turn, as members of trades unions, make laws to further hinder the American boy from learning a trade under the plea of keeping up wages by restricting the number of skilled mechanics that would be added to the ranks from apprentices native to the country."

New Iron and Steel Process.—A new process for the direct production of iron and steel from the ore is being introduced in Sweden by Dr. De Laval, the well known inventor of the cream separator and the De Laval steam turbine. A description of the process appears in the Iron Age written by Mr. Fred. H. Daniels, general superintendent of the Washburn & Moen Mfg. Co., of Worcester, Mass., who has recently returned from Sweden. The process consists in mixing pulverized iron ore with carbon, probably in the form of pulverized peat, and subjecting the same in some form of a rotating cylinder to heat, after which it is brought into direct contact with an electric arc of tremendous power, which reduces the ore to metallic iron. The melted iron then flows into a large and highly heated furnace, where it can either be manufactured directly into steel or cast into any suitable form for further treatment. Dr. De Laval commenced his experiments something like three years ago at Trollhattan. During this period he has been assisted by a competent corps of mechanical engineers and metallurgists, and it is evident these experiments have produced results, from the fact that he has purchased one side of the entire water power at Trollhattan, which is made up of four falls, an aggregate horse power of from 60,000 to 70,000. He has also purchased at considerable expense very much larger water powers in the north of Sweden. It is interesting in this connection to note that quite a number of the iron and steel works in Sweden have become so interested in the possibilities of this process that they have purchased all of the available water power in the vicinity.

The Economy of the Steam Turbine.—In the early days of the steam turbine, it was the almost generally expressed belief that however compact and otherwise convenient this form of motor might be, it would be found that it could not compare on the score of economy with the ordinary reciprocating type of engine. The later history of the development of the steam turbine shows very clearly, however, that not only can this species of rotary engine be relied upon as a durable and generally satisfactory motor, but also that in point of steam consumption, it will compare favorably with the best type of ordinary compound engines. The result of the trials of the Parsons steam turbine made by Prof. Ewing in December, 1891, were sufficient to prove that the efficiency of this type of steam engine had been much underestimated, while the progress made from that period is well exemplified by the excellent results of the tests of a De Laval steam turbine made in April last, of which particulars have just been published. The turbine in question was made by the Maison Breguet, of Paris, for a New York central station, and with a steam pressure of 145 lbs. per square inch, a vacuum of 26 in. the guaranteed steam consumption, when operating condensing, was not to be over 18.7 lbs. per brake horse power hour. The turbine disc has a diameter of about 0.75 metre (29.5 in.), and a thickness through the blades of about 10 mm. (0.4 in.) The disc runs at about 9000 revolutions per minute; and the two dynamos coupled to it at 750 revolutions per minute. A six hours test was made, during which independent readings of volt and ampere meters were taken by two observers every five minutes, these showing a water consumption of 19.275 lbs. per electrical horse power hour, or 17.348 lbs. per brake horse power hour, on the assumption that the commercial efficiency of the 100 kilowatt dynamos driven by the turbine was 90 per cent. The total power developed was 266 brake horse power. The exceptionally steady driving obtained by this type of motor is well shown by the five minute volt and ampere readings. The volts ranged during the six hours from 126 to 128.5, and the amperes from 672 to 765. The vacuum ranged from 25½ to 26 in., averaging 25.74 in.; the temperature of the inlet averaging 797 deg. F., and that of the discharge 103.5 deg. F. The steam pressure averaged 155 lbs. in the pipe, 150 lbs. at the stop valve, and 147 lbs. below the stop valve.

Eleven Days for Erecting a Locomotive.—A smart piece of erecting work was accomplished last February at the shops of the Campagnie de l'Est. Epernay, when a complete engine and tender were erected in 107 hours. The object in view, says Engineering, was not to break the record for this class of work, but to direct in an emphatic manner the attention of the foreman of the fitting shops, boiler yard, etc., to the necessity of sending their work into the erecting shop in a properly prepared condition. The engine in question weighed about 47⅛ tons empty,and was fitted with Westinghouse brake, steam and air heating plant, steam sanding apparatus, and equalizing beams. Moreover, the connections between the engine and tender were of an exceptionally elaborate nature. The erector's gang consisted of fourteen men and three apprentices though occasional aid was obtained from two or three extra hands. The working day was of ten hours' duration. All parts were brought to the workmen by means of a 30-ton traveler,which was almost entirely at their disposal.Portable electric boring and drilling machines were provided for the work, and as far as possible all parts were delivered in a finished condition, the frames being completely drilled and the cylinders being bolted together and fitted with slide valves and ascessories. The boiler was handed over to the erectors with all the fittings and valves in place, and the driver's cab was delivered completely finished. Under these conditions the work was found to take three hours less than eleven working days, the engine starting with fires up 107 hours after the work had been commenced.

A Large Steamship.—What is stated to be the biggest steamer afloat has recently been launched in Belfast. This is the twin screw steamer Pennsylvania, built to the order of the Hamburg-American Steam Packet Company. The following are the principal dimensions:—Length, deck measurement, 535 feet, beam 62 feet, and depth, from keel to awning deck, 42 feet, with a displacement of 30,000 tons. She will trade between Hamburg and New York, and will accommodate 200 first class passengers, 150 second-class, and 1,000 steerage. She is to be fitted with seventeen steam winches on deck, four steam cranes, while loading and unloading will be carried on through nine hatchways. About 20,000 tons weight and measurement will represent the goods-carrying capacity of the Pennsylvania, exclusive of passengers. A similar vessel is being built in Germany.

Drag-Shoes and Fixed Brakes at Sidings.—In a paper by a foreign engineer named Blum, it is held that in order to obviate the danger, and in many cases provide for the absence, of the ordinary lever brake on goods wagons, various drag-shoes and fixed brakes on the rails have been introduced on German railways for shunting in sidings. A drag-shoe has recently been brought into use in Brunswick, which consists of a base plate, technically called the tongue, 18.11 in. in length, on which, at a distance of 9.45 in. from its origin, is fixed the buffer or shoe, 4.49 in. in hight, the surface of which is tangential to the wheel at the point of contact. The tongue is an angle bar, the upper table of which gradually increases to a thickness of 0.39 in.; the appliance is kept in position on the rail by the vertical table, 1.38 in. deep, on one side, and on the other by a spring lever rod attached to the shoe. The total weight of this drag-shoe is 13.45 lbs., and its cost is 11s.; it is in use at the sidings at Cologne, and had at the time the paper was written brought 2,300 wagons to a standstill.

The author states that great inconvenience is found in the use of all drag-shoes, inasmuch as the speed of the wagon is reduced by more or less severe joltings, which are only diminished to a small degree by the introduction of a roller under the shoe. With the object of overcoming to a great extent this defect, brakes fixed on the rail have been invented and are in use at several sidings. The Rhotert brake of this kind consists of a series of flanged bars fixed between the sleepers on both rails, and actuated by a hand lever and rack and pinion. The movement of the bars is vertical, and thus causes the wheels to rise above the rail, being carried on the flanges of the bar; the support of the latter is so arranged as to cause the upper portion of the bar to act by pressure as a brake on the inner side of the wheel tire, and the pressure is therefore proportionate to the weight of the wagon. The rack and pinion is designed to permit the whole of the series of coupled bars—usually six in number—to be raised at one time or any less number desired. It has been found that the brakeman very readily estimates what number of bars it is necessary to bring into use for varying cases. The author also describes a fixed brake designed by Bussing which is in use at Munich, and which is a combination of the one described and a drag-shoe, the travel of the latter being limited by the length of the brake bars; the brake lever is weighted to give a varying pressure on the wheel tires.

A PLAIN STATEMENT OF FACTS.

Messrs. Greenlee Bros. & Company, have issued the following circular letter to their employes which puts the case frankly and fairly:

Office Greenlee Bros. & Co.,
225 W. Twelfth Street,
Chicago, September 30, 1896.

To Our Employes:—

We think it desirable to let you know at this time why we have recently been compelled to run only part time. We have been very fortunate the past year in securing orders for our special car building machinery, which have kept our shops busy while our competitors, owing to the general depression, have had little work. The first of July we felt sure of a good business for the balance of the year. We had a large order from a new car works company, who on July 6 cancelled it because, as they informed us—"In the face of the unsettled condition of the finances of the country we would not be justified in taking the machinery now. The silver craze that is now venting its force at the Chicago convention is certain to force this country into a panic, etc." We have since learned that they tried to get an order from a large railroad corporation whose manager told them that his company had obligations amounting to about $60,000,000, payable with interest in gold, and that if free silver went into effect his company would be compelled to take all freight and fares in silver, thus bankrupting them, and therefore they would not decide as to any new equipment until after the election. We recently wrote one of our car works customers, for whom we have built a large amount of machinery, as to the prospects for business in their line and received the following reply:

Terre Haute Car & Mfg. Co.,
Terre Haute, Ind., August 26, 1896.

Greenlee Bros. & Co., Chicago, Ill.

Gentlemen—In reply to your favor of the 21st inst.,

would say that the free silver agitation affects the car building business very much in the same way that it is shaping all business interests. The general stagnation and disinclination to reach out for new business makes a very great difference in the amount of freight that is moving at the present time. The freight car equipment is more than adequate to handle the limited amount of freight being shipped and will be more than adequate until sound money policy inspires confidence again. Under normal conditions the number of freight cars now in existence could not handle the business of the railroads, but until we secure an assurance of sound financial policy on the part of the government, we can see no possible improvement, but on the other hand, we anticipate the direst consequences in the event of the silver party winning.

Yours truly,
TERRE HAUTE CAR & MFG. CO.,
ROBT. S. COX, Gen'l Manager.

The following letter explains itself:

THE CLEVELAND, LORAIN & WHEELING R.CO. }
CLEVELAND, O., August 27, 1896. }

MESSRS. GREENLEE BROS. & CO.,

MR. D. B. CARSE, General Manager, Chicago.

DEAR SIR:—Your favor of the 21st inst. asking if we are still expecting to rebuild our shops at Lorain, was received during my absence on a vacation, hence the delay in replying.

We do not expect to rebuild this season, or at least until after it is definitely decided whether our country is to be run on a silver or a gold basis. If Bryan should win it may be several years before the shops will be rebuilt. Our business commenced to drop off on the day that it was decided in the Chicago convention that a silver man would be nominated for the presidency, and it has continued to fall off ever since. The decrease in our July earnings, as compared with a year ago amounted to over 40 per cent, and for the month of August we are showing up to the present time, a greater decrease. If the fear of silver winning has this effect upon business, I am unable to even guess what a realization would result in so far as our earnings are concerned.

All of the iron works, coal mines and other industries on which we depend have shut down because of there being no demand for any of their products, and we are suffering in consequence. While this condition lasts, the owners of our railroad will not consent to my investing one dollar of their money in improvements or anything else that is not absolutely necessary. I confidently believe if McKinley is elected and the silver idea is trampled under foot so deeply that there will be no prospect of its revival four years hence, that there will be sufficient confidence established in the integrity of this nation's finances, so that business in all departments will revive, and in that event you may expect to hear that our shops are about to be rebuilt, and we shall then want some of your machinery. At the present time we are doing so little business that we do not need the shops, and are therefore not prepared to accept any proposition from you whatever for furnishing us new machinery.

Yours truly, W. R. Woodford,
General Manager.

We are now paying about the same wages as in January, 1893, but since the democratic party came fully into power in the spring of 1893, there has been a great decline in nearly everything you have use for. We have made a careful inquiry into this and have letters from leading firms in their respective lines which give us the following information:

Since the spring of 1893:

Depression in rents - - - -	33 pr. ct.
" " clothing - -	25 to 33 pr. ct.
" " groceries, includ'g pork, ham, etc. -	40 pr. ct.

The free silver party claims that the free and unlimited coinage of silver at 16 to 1 would raise the price of farm products and things generally. If this is true we cannot see how this will benefit you, as we certainly will not be able to raise your wages or even give you work when those to whom we mainly sell will have to retrench to the utmost to pay their obligations in gold or go into insolvency.

In 1891 the president of our company, Mr. R. S. Greenlee, went around the world and took time to investigate as to the wages paid. In the silver countries of China and India he found that laborers and mechanics received about one-tenth of the wages paid here. At that time in those countries a Mexican silver dollar was equal to our gold dollar. In China, about one thousand miles from the coast, he sold a large amount of our machinery to a firm that only used hand labor and employed about 450 carpenters. In 1895 our vice president, Mr. R. L. Greenlee, visited the same countries and found that wages had not changed, although silver had declined nearly one-half since his brother was there four years previous. The value of silver fluctuated from time to time and by taking advantage of this he saved a considerable amount on the purchases he made. He called on the firm that had bought our machinery through his brother and found that it had not been unboxed, as they had concluded that it would be hard to save anything with machinery as compared with hand labor at the wages they were paying. He met our consul at Canton. Mr. Seymour, who has been there for many years and now desires to return to this country, but as he accumulated about $18,000 before the depreciation of silver he does not feel able to sacrifice one-half the value of it, and therefore is compelled to remain. In India he met many Europeans who had made accumulations and investments there, and were unable to return to their native countries for the same reason. This spring Mr Greenlee and our manager, Mr. Carse, visited several factories in Great Britain and found them very busy, particularly the woolen mills. The owners said that they were shipping most of their goods to the United States, and were anxious to learn when our tariff might be raised.

We have presented to you facts, not theories, and leave you to draw your own conclusions. It is our opinion that what this country needs at present is an adequate tariff to protect our own workmen, stimulate new industries and raise sufficient revenue to pay the expenses of the government; honest money of fixed value equal to the best in the world, and a party in power that will see that our laws are enforced and thus give confidence to those having money now waiting investment.

GREENLEE BROS. & CO.

SHALL WE EXPERIMENT WITH THIS?

From 1803 to 1873 France changed her ratio 113 times and finally abandoned unlimited coinage as utterly impracticable in 1873.

HAS THE DOLLAR GONE UP AND PROPERTY DOWN?

True value of all property in the United States,
1870—$30,000,000,000.
1890— 65,000,000,000.

Increase of wealth over 100 per cent and population 60 per cent.

ISN'T THIS THE MAIN REASON FOR SILVER DROPPING IN PRICE?

Yield of silver in the world 1873, 63,000,000 oz.; 1894, 168,000,000.

DO YOU OBJECT TO THIS?

PURCHASING POWER OF AVERAGE WAGES.

1860	1865	1870	1875	1880	1885	1890
100.	66.0	114.0	124.01	132.3	162.0	172.1

HAS THE GOLD STANDARD CUT WAGES IN HALF?

From 1870 to 1890 wages increased 28 per cent and their purchasing power 60 per cent.

ARE WE BEING DRIVEN INTO BANKRUPTCY BY SCARCE MONEY AND HIGH INTEREST?

In 1873 the total money in the country amounted to $18.58 per capita, in 1894 it was $35.44 per capita. Since 1873 rates of interest have fallen 50 per cent.

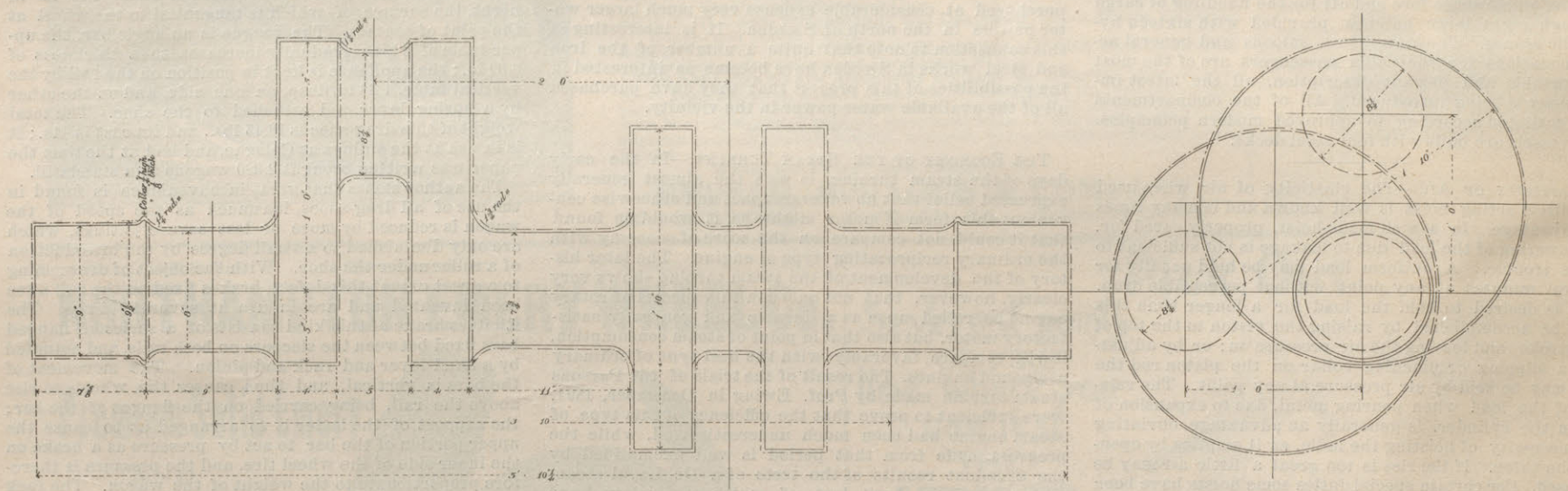
WHY DOES BYRAN SAY "THE TARIFF IS NOT AN ISSUE IN THIS CAMPAIGN."

Twenty-seven years of protection (1865-1893) decreased our public debt $1,747,301,878.

Three years of the Wilson bill (1893-1896) increased our public debt $262,329,630.

LOCOMOTIVE CRANK AXLES.

In the discussion of the paper by Mr. J. A. F. Aspinall, chief mechanical engineer of the Lancashire & Yorkshire Railway, England, before the International Railway Congress upon express locomotives, a topic of interest was crank axles. In connection with this subject several representatives from English railways spoke in high terms of this form of driving axles, and specially with regard to their strength and satisfactory service. Mr. Wilson Worsdell, locomotive superintendent of the North Eastern Railway, spoke of his experience and mentioned his design of circular webbed crank axles as having given exceptionally good results. Through the courtesy of Mr. Worsdell we are enabled to illustrate this design, which is of special interest in consideration of the fact that there are 950 and more of these axles now in service on the road referred to,



LOCOMOTIVE CRANK AXLES.—FIG. 1.—CIRCULAR WEBBED PATTERN—NORTH EASTERN RAILWAY.

and up to the present time there has not been a single failure. Quoting from Mr. Worsdell's letter: "I find that although the first cost of circular webbed crank axle is much greater than the ordinary forms, yet after having had ten years' experience with them, they practically in the long run will be found to be much cheaper and the cost of machining is very much less than the ordinary forms." In the drawing the full lines give the finished sizes, and the large fillets are worthy of notice. Mr. Worsdell's remarks in the same direction before the International Railway Congress are as follows:

"We on the North Eastern system have a special circular webbed crank axle for use on our standard types of engines. I may say that we have at this time (1895) over 850 of these crank axles running; very many of them have run over ten years now, and we had only one failure among this large number, and that one was broken, not in the crank, but in the driving wheel seat from an incipient flaw which it was impossible to detect."

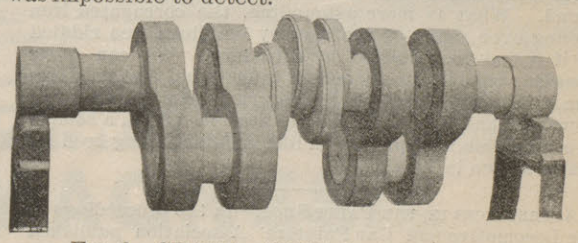


FIG. 2.—CRANK AXLE—L. & N. W. RY.

There are several reasons why this form of axle has not held popularity in this country, but it does not seem just to the design that it should be condemned on account of a lack of strength, or what perhaps may be considered the same thing, the liability of failure without warning. The experience abroad does not indicate any fear, and in fact the results seem to be highly satisfactory; so much so that inside connected engines are the rule in England, and in view of the advantage to be gained with regard to jacketing the cylinders, when placed under the saddles, this plan has something to recommend it. It is worthy of note that the English designers who make use of this form of axle are firm believers in the advantages which it offers. In the discussion before the congress Mr. Aspinall stated that he had often been asked by American engineers concerning the length of life of these axles, and while he did

not touch upon this point in his paper he took it up in the discussion and showed that many of the views which were held in regard to it were erroneous, with particular reference to the reliability of the axles. One reason stated for this uncertainty, with regard to the strength of the type of axle, was the fact that the Board of Trade returns include all axles which break in service. The distrust was because of the fact that the records show quite a large proportion of breakages which occur soon after the axles are put into service, and to offset this no mention is made of the long lives of others, the inference drawn from the reports being that the design makes the life of service short.

Mr. Aspinall stated that he had a number of axles in service which had run 600,000 miles, and which were removed on account of being of an old pattern and not because of any fear lest the axles should break. He recommends the crank axle very strongly and does not take any stock in the theory that axles should be removed from service after making, say, 200,000 miles.

An interesting design of crank axle has recently been worked out by Mr. F. W. Webb, chief mechanical engineer of the London & North Western Railway, which was illustrated and described in a recent issue of the Railway Engineer, from which the accompanying engraving was reproduced. This axle is built up with enlarged cranks and with large fillets except on the crank pins, the fillets being omitted there to increase the bearing area. The axle is made in nine pieces, the central portion of which includes the eccentrics, and is made in one one piece. The pins and journals are case hardened and it is stated that the cost of making one of this form is very much less than that of the one piece axle.

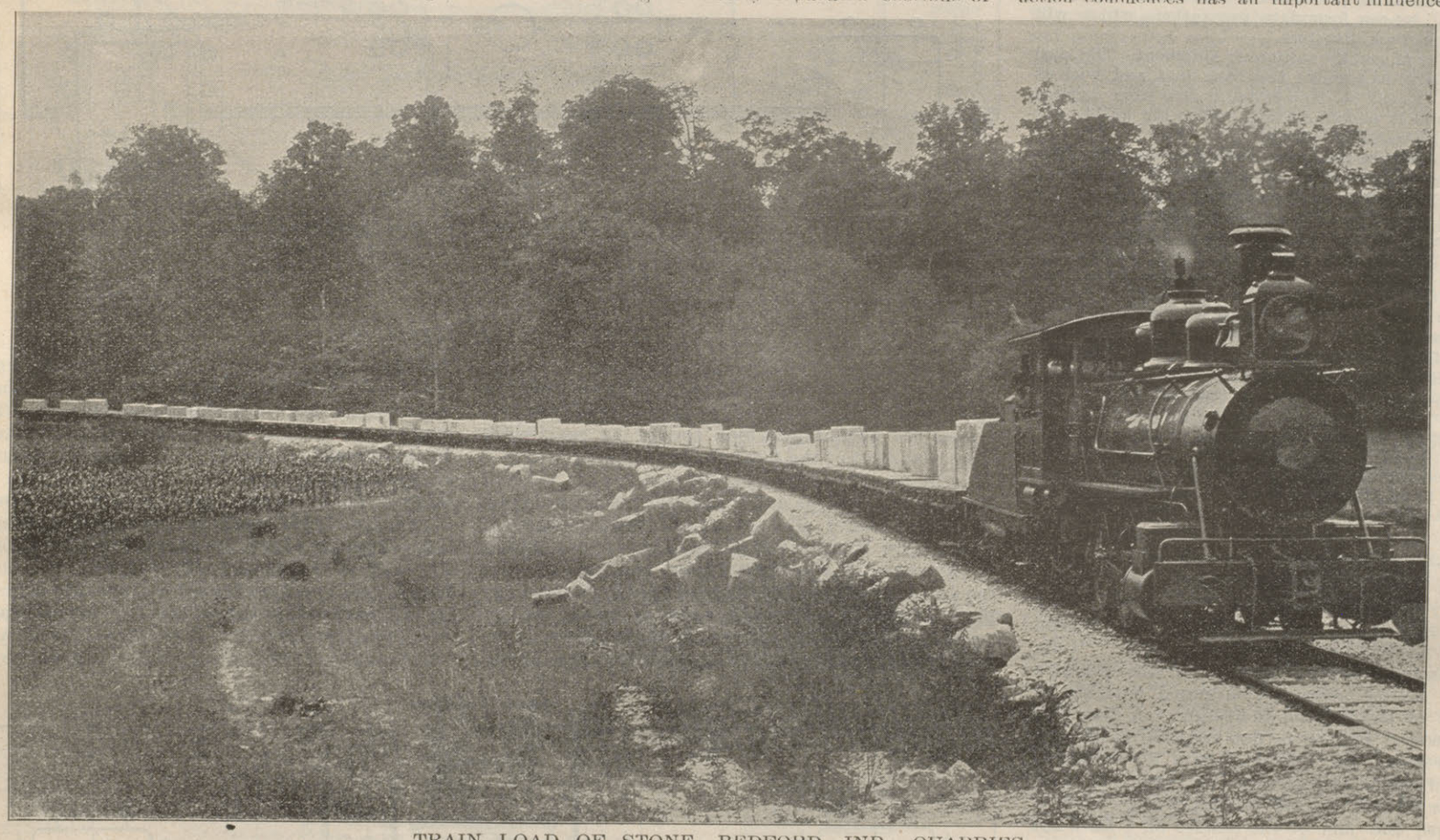
EXCURSION OF THE WESTERN SOCIETY OF ENGINEERS.

The excursion of the Western Society of Engineers on October 16 and 17 to the stone quarries and cement mills of Indiana was a great success, and was important not only to the engineering and building interests generally, but also to railroad companies. There were 170 members of the society and their friends in the party. The Monon road, the Bedford Stone Quarry Companies and the Louisville Cement Company were the hosts. A special train of five sleeping cars and a baggage car was tendered by the Monon for this occasion. The train left Chicago from the Polk and Dearborn depot at nine o'clock Thursday night, October 15. All of Friday morning and afternoon were spent among the quarries at Bloomington and Bedford. At the quarries the party was in charge of Mr. H. S. Martin, representing the Bedford stone interests. Mr. Martin was assisted by some of the other officers of the company. A great deal of care was used in giving the excursionists complete information as to the manner of quarrying the stone, or running it through the mills where it is turned, planed and otherwise shaped for use, the method of shipping from the different quarries so as to reach railroads in the district, and other valuable information.

Louisville was reached at 7:30 Friday night, where the excursionists became the guests of the Louisvill Cement Co., and were in immediate charge of Mr. J. B. Speed, secretary of the Western Cement Association. Saturday was spent among the cement quarries or mines, and the mills near Louisville; a visit was also made to the Louisville water works where a striking illustration of the uses of the Bedford stone and the Louisville cements was shown in the immense foundation of the water works plant and the reservoirs. The stack of the water works has a diameter of 57 ft. at the base and a diameter at the top of 14 ft. It is 214 ft. high and is built of solid masonry.

It is calculated that the cement mines cover an excavation of about 30 acres. They were opened 30 years ago and do not yet show any signs of being exhausted. The party was entertained at the Louisville Hotel by the hosts. The return journey was commenced at about 9 o'clock Saturday evening; the train arriving in Chicago, Sunday morning, October 18.

The experience of 30 years' use of the stone taken from the Bedford quarries has so thoroughly established its reputation for durability that the demand for it is increasing in widely separated sections of the country. The stone is so readily and cheaply quarried that it can meet the competition of many stones heretofore used in other sections, but which are harder to handle and more expensive to work up. The Bedford stone is extensively used in railway structures, such as stations and bridges, in public buildings and residences, depot buildings, tunnel facings, and subways for parks and boulevards in many of the large cities, and in fact all parts of the country east of the Rocky Mountains, and the railroad companies are getting the benefit of freight represented in transporting this material. These quarries are tapped immediately by the Monon road and are reached over the Bedford Belt road in connection with the Baltimore & Ohio Southwestern, Evansville & Richmond, Panhandle, Big Four and other lines and so that the railroad companies generally should be especially interested from a transportation standpoint in the further development of these valuable quarries. The accompanying illustration of a stone train on the Belt railway gives the idea that the amount of traffic originating in these quarries is considerable.



TRAIN LOAD OF STONE, BEDFORD, IND., QUARRIES.

The earnings of the Wagner Palace Car Company for the year ending June 30 last, as shown by the annual report just published, were $3,660,333, an increase over the previous year of $307,391. Dividends amounting to $1,520,000 were paid and a surplus of $47,890 carried over.

SPONTANEOUS IGNITION OF COAL.*

The heating of masses of coal exceeding 2.000 tons has led to such inconvenience and loss in shipment and storage as to render the question of spontaneous ignition a serious one, and in 1875 the losses of life and property were so great as to demand attention from a royal commission. The report of this commission had little beneficial effect, as is shown by the fact that in the nine succeeding years 57 coal laden vessels were known to have been lost from this cause. The trouble is greatest at sea, but is by no means unimportant in storage of coal. Coal is of a vegetable origin, formed by heat and pressure upon woody fibre and resinous constituents of an early vegetation, the process being carried on out of contact with air. Coal is a form of charcoal which is very dense, and beside carbon and hydro-carbons it contains mineral substances such as pyrites, and the chemical actions resulting in heating are those which take place when the carbon, hydro-carbons and coal brasses or pyrites contained in newly mined coal come into contact with air and moisture.

The greatest influence in the heating action is carbon, which acts to attract and condense gases to a degree depending upon the fineness of division of the carbon, new coal sometimes absorbing three times its volume of gas. The action is influenced greatly by temperature. When the carbon of coal absorbs oxygen the compressed gas becomes very active chemically and combines with the carbon and hydrogen of the bituminous portions converting them into carbon dioxide and water vapor with a rapidly increasing temperature which finally reaches the igniting point. The temperature of the coal before the action commences has an important influence, an analogous case being that of oily waste or cotton which if warmed to 130 deg. F. will ignite in one and a quarter hours, whereas at ordinary temperatures it does not ignite within several days.

The earliest theory of spontaneous ignition of coal was that the heat was due to the oxidation of pyrities, which was shown to be erroneous twenty years ago, but in spite of this the idea is quite generally accepted at the present time. Dr. Percy showed in 1864 that oxidation of the coal had much to do with the action. There is considerable action, however, between oxygen and finely divided portions of pyrites with efflorescence, and from this action the opinion has prevailed that the heating is due to the oxidation of the pyrites. The only way in which pyrites in the cleavage of coal can assist spontaneous ignition is that when they oxidize they swell and cause disintegration of the lumps of coal so exposing fresh surfaces to absorb oxygen and afterward carry on chemical action. I have carefully determined the igniting point of various kinds of coal and find that—

Cannel coal ignites at 690 deg. F.
Hartlepool coal ignites at 766 deg. F.
Lignite coal ignites at 842 deg. F.
Welsh steam coal ignites at 870 deg. F.

Heating does not take place as a rule with newly mined coal unless piled in unusually large heaps. It at once commences to absorb oxygen from the air, but in small heaps the circulation around the lumps keeps down the temperature. After repeated handling when the coal becomes powdered as in its loading upon ships, the large surfaces exposed freshly to the air cause rapid absorption of oxygen and consequent rise of temperature.

On examining the evidence to be obtained as to the conditions under which spontaneous ignition of coal usually

*Summary of a paper by Mr. Vivian B. Lewes, F.I.C., F.C.S.—From the Transactions of the Society of Arts.

akes place, it is found that the liability increases with:

1. The increase in mass of coal. The larger the mass the more the conducting material between the coal which is heating and the outer air, also the larger the mass the greater will be the disintegration.

2. The ports to which shipments are made; 26,631 shipments to European ports in 1873 resulted in ten casualties against sixty from 4,485 shipments to Asia, Africa and America. The increase of temperature in the tropics converts a slow action into a rapid one.

3. The kind of coal. Pyrites has no heating effect and a sure guide is to be found in the quantity of moisture present in an air dried sample of coal. The higher the amount of moisture held by the coal after exposure for some time in dry air, the greater will be its power of absorption of oxygen and its liability to spontaneous heating.

4. The size of the coal. Small coal being more liable to to this trouble than large, on account of the greater surface exposed.

5. Shipping or storing coal while wet. At first external wetting retards the absorption of oxygen, but the presence of moisture afterward increases the action of the already absorbed oxygen upon the hydro-carbons of the coal and so causes a serious increase in the heating.

6. Ventilation of the mass of coal. Ventilation increases the difficulty unless cool air is furnished continuously and freely throughout the coal.

7. Rise in temperature. Anything which tends to increase the initial temperature hastens the chemical action. Causes can sometimes be traced to steam pipes, boiler flues and warm wal's.

Having now discussed the chemical and physical conditions which lead to the phenomenon known as "spontaneous ignition," we can formulate precautions which will tend to prevent such disasters.

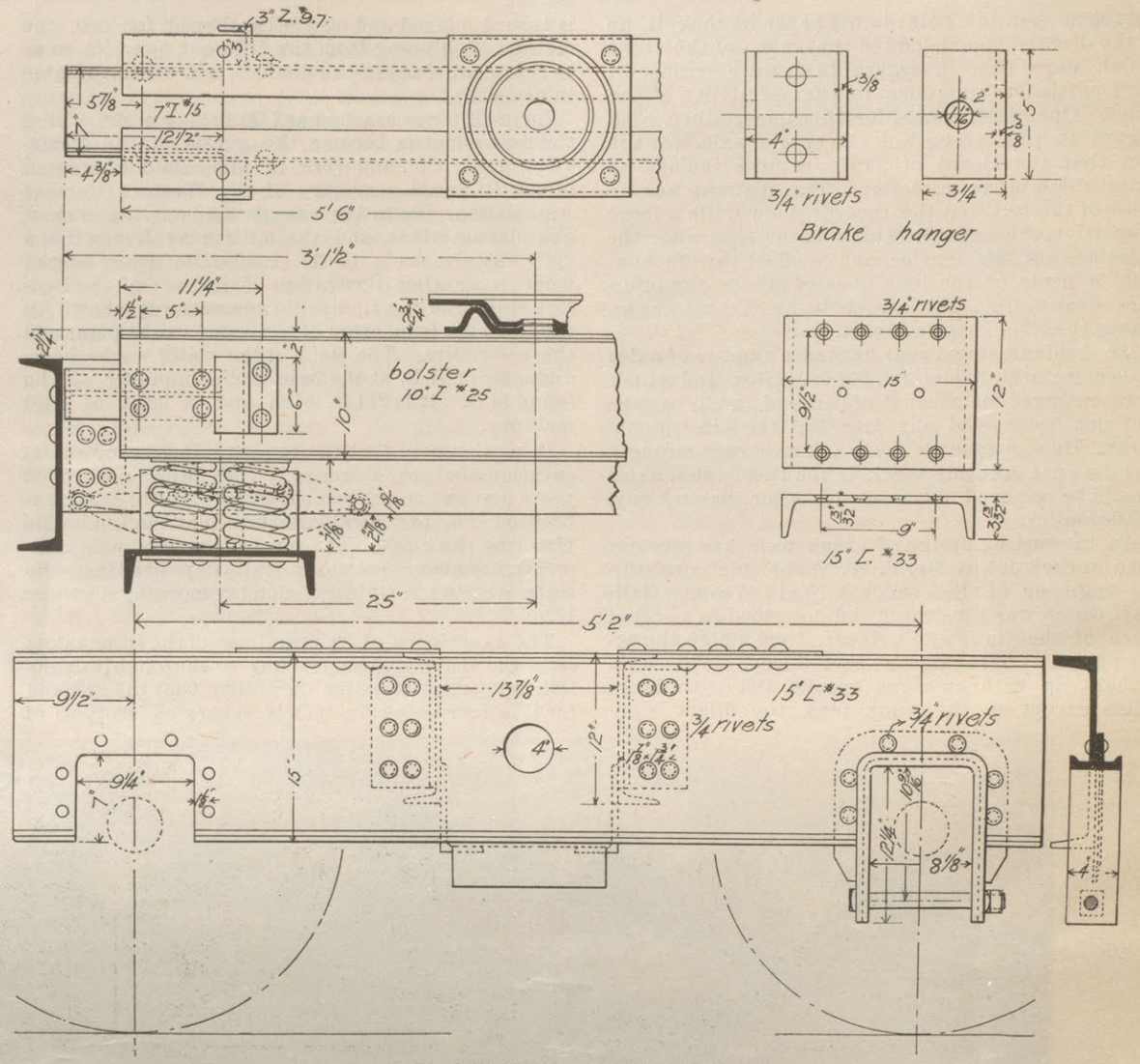
1. The choice of coal for storage or shipment. The coal should be as large as possible, free from dust, and with as little "smalls" as can be. It is better as free from pyrites as possible, and it should contain, when air dried, not more than 3 per cent of moisture.

2. Precautions to be taken in storing or loading. The coal should be well roofed in, and have an iron floor bedded in cement; all supports passing through and in contact with the coal should be of iron or brick; if hollow iron supports are used, they should be cast solid with cement. The coal must never be loaded or stored during wet weather, and the depth of the coal in the store should not exceed 8 ft. and should only be 6 ft. where possible. Under no conditions must a steam or exhaust pipe or flue be allowed in or near any wall of the store, nor must the store be within 20 ft. of any boiler, furnace or bench of retorts. No coal should be stored or shipped to distant ports until at least a mouth has elapsed since it was brought to the surface. Every care should be taken during loading or storage to prevent breaking or crushing of the coal, and on no account must a large accumulation of small coal be allowed. These precautions, if properly carried out would amply suffice to entirely do away with spontaneous ignition in stored coal on land.

One of the most prominent superintendents of motive power, who is known as a conservative man, was recently heard to bemoan his fate in not being rated as a man of any importance for the reason that he had not built any heavy locomotives. "I am simply not in it any more," he said, "because a man's mechanical ability nowadays is gaged entirely by the weight of the engine he designs. A man who designs a 60-ton engine is not considered of very much importance; one who designs a 70 ton engine is worthy of slight recognition, but one who gets up an 80 or 90 ton engine is simply a h——l of a fellow. Now, the fact of the matter is, I have not seen my way clear to use any of these heavy engines, and so I don't amount to anything at all. I have built a bigger box car than any of them though, and that may help me out a little, but I guess that is my only chance for making a reputation."

TWO NEW TRUCKS FOR FREIGHT CARS AND TENDERS.

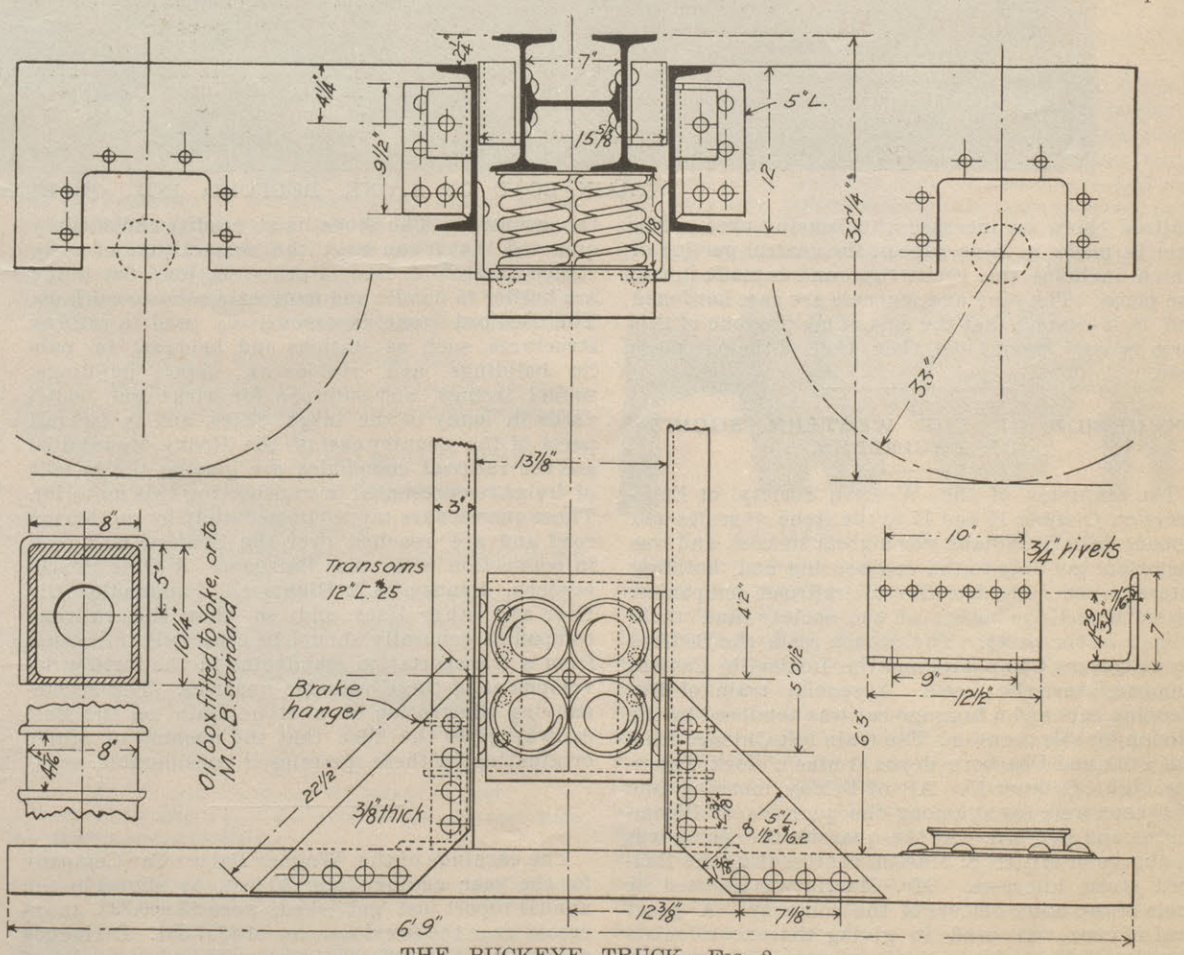
The advantages offered by metallic construction for trucks of freight cars and tenders, has brought out a number ot new designs, among which an interesting example is shown by the accompanying illustrations, which were prepared from working drawings of a new truck recently designed and placed upon the market by the Buckeye Engine Co., of Salem, Ohio, the patents for the trucks having been taken out by Mr. A. K. Mansfield, mechanical manager of the company. The illustrations show two styles of trucks, Figs. 1 and 2 representing a form which has been tried in severe service and which is constructed entirely of commercial shapes. Figs. 2 and 3, show another form which employs pressed steel side frames, and in which commercial shapes are used for all the rest of the members. The drawings are given in detail, with sectional views so arranged as to make the method of construction clear and easily understood. The special feature of these two designs which is of importance to the builders and users of cars, is the fact that repairs may easily be made by any one on account of the principal members being of such forms as may be readily obtained



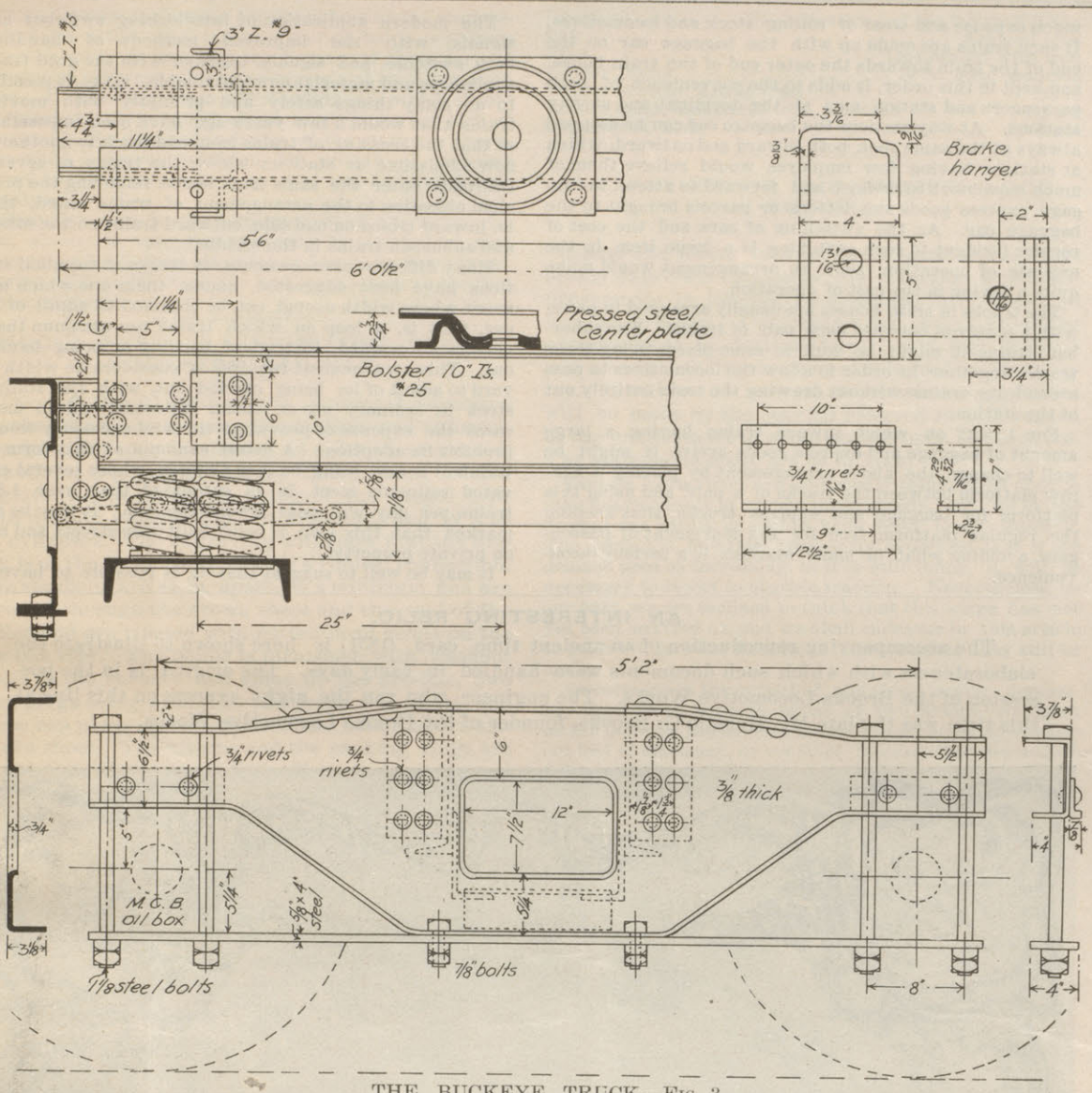
THE BUCKEYE TRUCK.—FIG. 1.

in the market. The only special piece in either truck is the pressed steel side frames of the one shown in Fig. 2. This use of standard shapes constitutes an advantage which should be considered along with that of the total absence of wood.

It will be seen that no new principles are employed in the designs and that both trucks are built upon the general plan of a rigid bolster diamond truck. The bolsters rest directly on springs which are supported by the truck frame, and the construction is such as to admit of using either elliptical or spiral springs, the drawings showing spiral springs in place, and elliptical springs, in dotted lines, in order that the arrangement with that form may be understood. The springs, instead of resting upon the usual form of spring plank, are placed upon short platforms of angle irons and channel bars. The design shown in Figs. 1 and 2, employs side frames of 15 in. channels weighing 33 pounds per foot in which recesses are cut near the ends to receive the oil boxes. These recesses are cut from the channels by a cold saw. The transoms are made of 12 in. channels weighing 25 pounds per foot and the bolster of a pair of 10 in. I-beams, also weighing 25 pounds per foot. It is apparent that this truck can be produced or repaired within the facilities of an ordinary railway shop on account of the fact that only a few parts, and these are small ones, need to be shaped



THE BUCKEYE TRUCK.—FIG. 2.

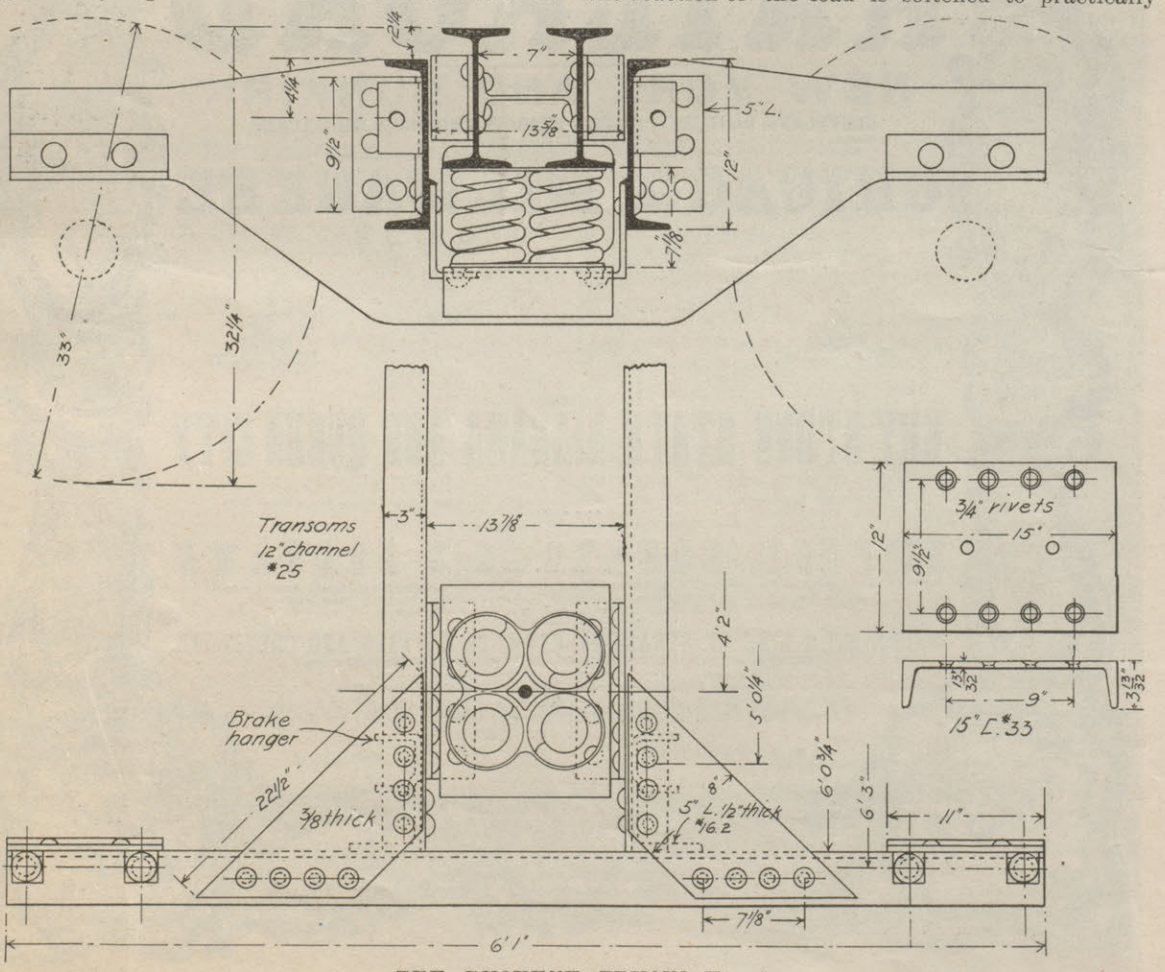


THE BUCKEYE TRUCK.—FIG. 3.

while hot. In the design shown in Figs. 2 and 3, the side frames are formed of a sheet of steel ⅝ inch thick, pressed into shape, or it may be built up of a sheet of similar thickness reinforced at the edges by angle irons riveted on. The chief object of this form is to utilize the M. C. B. oil box without change, and to retain the general appearance of the diamond truck.

The manufacturers of these trucks have made comparative tests covering considerable time, with a view of determining whether riveted trucks having their springs on the oil boxes are less severe on the joints and rivets than is the case when the springs are applied in the usual manner as illustrated here. In their experience, they do not find the advantage of the springs over the oil boxes to be verified, which they state may be due to the fact that the greatest stresses to which a truck is subjected are lateral rather than vertical. These people also question whether the argument in favor of placing springs on the oil boxes is sound, stating that so long as the springs support the load wherever they may be placed, the action of bad joints, or the reaction of the load is softened to practically the same extent in the truck frame.

The weight of the finished truck frame represented by Figs. 1 and 2, is 1430 pounds. For the purpose of comparison with the weight of other trucks, to this amount should be added the weight of center plates, side bearings, springs, oil boxes, wheels, axles and brakes. The riveting is thoroughly done which, together with the fact that the number of rivets used is very liberal, makes the entire frame, outside the bolster, to all intents, a single rigid piece, incapable of distortion from any of the strains of legitimate service. All the parts are calculated to be, and are found to be in service, amply strong for an 80,000 pounds load.



THE BUCKEYE TRUCK.—FIG. 4.

RAILROAD TERMINAL STATIONS.*

After the location of a terminal station has been determined, the element next in importance is the arrangement of the buildings and tracks. The headhouse usually contains the waiting rooms for passengers, with ticket offices, toilet rooms and lavatories for men and women, news stands, restaurants, telegraph and telephone offices and information offices. It is also necessary to provide for baggage and express rooms and often a place for milk. Besides the above noted rooms pertaining directly to the passenger traffic, provision must be made for many things incident to such traffic, rooms for trainmen, for sleeping car companies, for the station officials, store rooms and others for uses connected with the passenger business, but not used directly by the passengers.

The headhouse should be designed, having regard principally for the safe and convenient transaction of the passenger business and its appurtenances as noted above. After this has been thoroughly provided for, the offices and rooms for officials and employes can be arranged in such way as not to interfere with the comfort and convenience of the passengers.

Of course, each case has its own conditions, varying often from others in such manner that precedents already established must be widely departed from, in order to reach the best results, In general, the station should be so designed that, baggage, express goods and milk, with such other articles as may be received or delivered at the station, shall be handled either below or above the level of the tracks, in most cases, it must be below such level.

There are several reasons why such an arrangement is desirable. The movement of passengers and of trucks conveying baggage on different levels makes it safer and easier for people to make such movements as are necessary or desirable about the station. The risk of injury to passengers is much lessened. Less platform room is required for the same amount of business. The movement of both passengers and goods can be made promptly.

On the score of economy of space and cost of land, it is better to have all work pertaining to baggage and goods under the head house and train shed below the level of the tracks, thus making two uses of the ground area, quite an important saving where land has such value as is generally the case near the business centers of cities. A much smaller area will be required to provide suitable space for the traffic than if used only once.

Such an arrangement renders it possible also to give more and better space to carriages and teams receiving and delivering baggage and goods, also to separate the receiving and delivering points in the station, of the various classes of traffic and to reach a systematic handling of such traffic, which is usually impossible when it is all handled at the same point.

With the tracks above the level of the surrounding streets, passages can be made from the tracks to the streets by the most direct course, enabling passengers arriving on trains to disperse much more easily and quickly than if they are obliged to all pass along the platform and out through the headhouse. At times of extraordinary movement of passengers this is quite an important element in their safe and prompt movement.

Objection is sometimes made to such an arrangement, that it renders it necessary for passengers to go up or down stairs and that elevators are needed for the use of passengers. With careful planning, inclined ways can generally be provided which can be used by such passengers as object to climbing stairs.

Placing the tracks at a higher level also admits of crossing above the streets near the station, avoiding the necessity of crossings at grade or of expensive changes of streets, which in important cities carry with them not only the great direct expense of making the changes, but also a greater indirect expense

*From a paper presented by Mr. E. K Turner at a meeting of the New England Association of Railroad Superintendents, Oct. 12, 1896.

n the detrimental effect on the value of property.

It is also possible generally, to obtain better architectural effect with the tracks above the street level, as is well shown in many of the stations recently built in London and various German cities and notably in the terminal stations in Philadelphia.

With the baggage and such merchandise as is handled at the station, below the tracks, out of the way of passengers, it is possible to so plan the rooms devoted to the use of passengers as to reach the best and most convenient arrangement.

The rooms most used and those to which particular attention should be given are the outward reception or waiting rooms. Passengers wait here for trains, often for a long time and the rooms should be made light and comfortable, special attention being given to ventilation. The waiting rooms usually on one side face the street or approach, on the other, open into the train house, the latter, especially in stormy weather is dark and does not afford much light to the waiting rooms, so that where possible, the waiting room should be lighted from the top; this arrangement also admits of providing good ventilation. Seats should be so made as to be of comfortable form and at the same time easily cleaned, offering few places on or under them for lodgement of dust and dirt, and no parts in which it can be concealed. The finish and coloring of the rooms should be light and cheerful. In placing the seats, account should be taken of the movement of people through the room and the seats so placed as to interfere as little as possible with the usual current of movement, for the comfort of both those occupying the seats and those passing through.

Provision should be made for easy access to ticket offices, water closets, and other rooms devoted to the use of passengers from the waiting room.

A liberal provision should be made for artificial light, with no dark corners. Doorways and passages should be made wide, with doors swinging outward from the waiting rooms, and both ways in such passages as are used by passengers going to and from trains.

Generally at terminal stations, space is allowed for carriages and cabs to stand while waiting for inward trains. In many of the English stations, a wide space between platforms at which long distance trains arrive, in the train house, is devoted to this use, so that passengers leaving the cars can go directly across the platform into the cab. The English custom of carrying the greater part of the luggage with the passenger in the cars, makes it possible to use such an arrangement to better advantage than would be the case in this country.

There is one practical objection to providing room for carriages under cover. Without the greatest care and sometimes even with it, it is impossible to keep such places sweet and free from odors. Every where around a station that horses stand, the sunshine and rain should have free access.

In designing a train house, if the cost can be ignored, a roof of large clear span is desirable, but with most railroads it is necessary to consider the first cost, and as short spans with a row of posts between each pair of tracks gives the greatest economy in construction, this plan has been followed in many of the train houses recently built. With the improvements in the manufacture of glass, it has become possible to make a large portion of the roof covering transparent, thus giving good light to the interior of the train shed.

The greatest objection to the method of construction noted, that is, short spans with posts, is the trouble experienced in taking care of snow and the difficulty of keeping the roof tight.

Platforms between tracks should be of some hard material, which can be easily kept clean. The surface of platforms should be on the same level as the top of rails, so that baggage trucks and other wheeled vehicles can pass from one platform to another upon the same level, thus doing away with the need of moving such vehicles on the same platform with passengers taking or leaving trains. This construction is also safer for passengers, especially for those who get on or off moving trains.

In organizing the train service in a terminal station, the writer believes that unless there is some very serious practical objection, inward long distance trains should always enter on one side of the train house and outward long distance trains depart from the other side, although such arrangement may cause more crossing of trains on tracks outside the train house. All provision for the accommodation of passengers can be made more easily, if such movement of trains is strictly adhered to and it renders unnecessary the mingling and crowding of passengers going in both directions and the passing of incoming passengers through the waiting rooms, where such movement always results is discomfort and inconvenience to those waiting to take trains.

The middle tracks, those between the inward and outward tracks devoted to long distance trains, should be used for short distance, suburban trains. These suburban trains can be unloaded and loaded on the same track, that is, enter the station, discharge the inward passengers, take on outward passengers without switching, another engine backing on to the train and hauling it out, relieving the engine which brought the train in. This engine can follow the train out, going to some place where provision has been made for turning and taking water. It can there be made ready for its next trip.

This arrangement admits of the movement of suburban trains without switching or useless movement, saving much expense and wear of rolling stock and locomotives. If such trains are made up with the baggage car on the end of the train towards the outer end of the train house, and kept in this order, it adds to the convenience of both passengers and station men at the terminal and at way stations. At way stations the baggage car can be stopped always at the same spot, both inward and outward, which at stations having few employes would relieve them of much movement backward and forward to attend to baggage, express goods and letters or parcels brought in the baggage car. As the switching of cars and the cost of repairs incident to such switching is a large item in the expense of operation, such an arrangement would make quite a saving in the cost of operation.

The tracks in train houses are usually arranged in pairs, with a platform between each pair of tracks. For suburban trains it might be well in some places to lay three tracks together in order to allow the locomotives to pass around its trains without drawing the train entirely out of the station.

For tracks on which inward trains having a large amount of baggage and express goods arrive it might be well to change the above arrangement by placing a narrow platform between the tracks of a pair, and using this platform for baggage and express trucks, thus keeping the regular platform free for the movement of passengers, avoiding what in many stations is a serious inconvenience.

The modern application of interlocking switches and signals, with the improved methods of handling both switches and signals, together with the good track appliances and material now obtainable, make it possible to do many things safely and promptly with moving trains that would a few years ago have been impossible, so that the crossing of trains from one track to another is now admissible at stations where the trains of several railroads enter the same train house, removing the principal objection to the arrangement of trains noted, that is, inward trains on one side, outward trains on the other, and suburban trains in the middle.

Many different arrangements of tracks at terminal stations have been suggested, among them one which has merit where width enough can be obtained to admit of its use, that is, a loop on which trains can continue their movement onward, instead of backing or being hauled out. This arrangement requires a considerable width of yard to admit of its being carried out, with the rolling stock in ordinary use on steam railroads, and in most cases the expense of providing the land necessary would prohibit its adoption. A goood example of this form of terminal is now being built in Chicago, where several elevated railroads meet, it is estimated that over 1,500 trains per day will pass around the loop. It may be remarked that this loop is being built over streets and not on private property.

It may be well to suggest that it is possible to have a

AN INTERESTING RELIC.

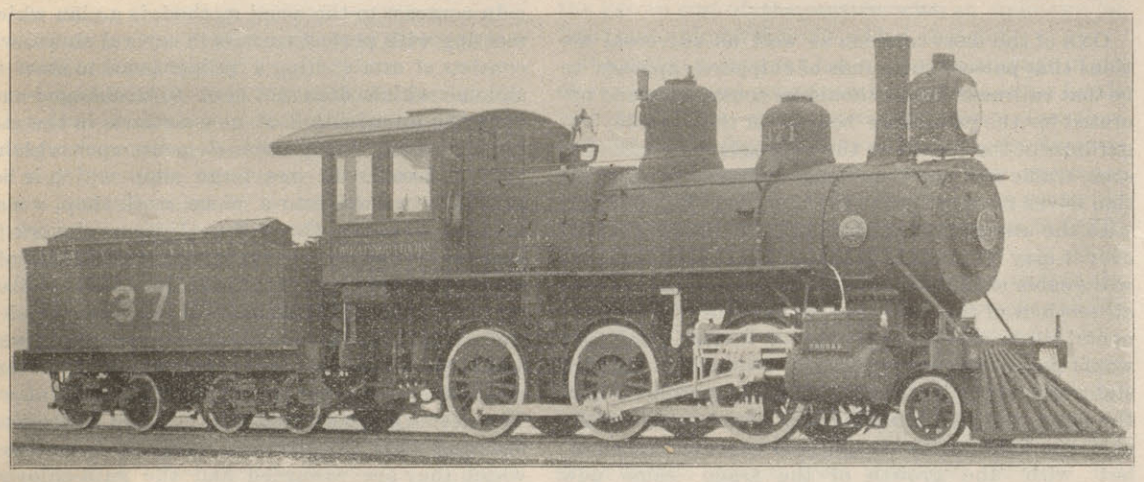
The accompanying reproduction of an ancient time card (1851) is here shown to illustrate the elaborateness with which such documents were handled in early days. The original is in the possession of the Brooks Locomotive Works. The engineer who ran the night express on this line at this time was the late Mr. Horatio G. Brooks, founder of the Brooks Locomotive Works.

terminal station too large. Anything beyond the room required for active use is not only wasted, but is positively objectionable. It increases the distance of those parts of the station between which passengers and employes must pass. It furnishes room for standing cars which should be stored elsewhere, and leads to carelessness and lack of neatness in the care and policing of the station. Therefore while a proper provision for growth of business should be made, care should be used not to carry this to extreme.

Whatever may be the arrangement of a terminal station, success in operation can only be reached by good management and close attention to details by those in authority, with strict discipline and promptness on the part of the employes.

MOGUL FREIGHT LOCOMOTIVE—GREAT NORTHERN RAILWAY.

Through the courtesy of the Brooks Locomotive Works, the accompanying illustration and information from the specifications of an order of twelve locomotives, is presented here. There were twelve engines in this order all being of the mogul type with driving wheels 55 in. in diameter, and 19 x 26 in. cylinders. The engraving will show that the fire-box is of the Belpaire type with a conical connection. The staybolts are 4¾ in. apart, as a minimum, and are screwed through the crown sheet and the roof of the boiler and are riveted with button head rivets on the fire-box side. The boiler is furnished with washout plugs in the corners and sides of the fire-box, two 4 in. plugs being placed in the front flue sheet and three cap plugs on both sides of the boiler above the crown sheet. The pistons and the packing rings are of cast iron. The piston rods are 3½ in. in diameter and are hammered iron. Jerome metallic packing is used on the piston rods and valve stems. The side and main rods are of iron, bushings being used on the back end of the side rod and straps and brasses on the front end of the side rod and the back end of the main rod. The tender has two four-wheeled trucks of the standard pattern used on the Great Northern Railway and the tender frame is of steel channels.



BROOKS MOGUL LOCOMOTIVE—GREAT NORTHERN RAILWAY.

These locomotives are equipped with a 1¼ in. siphon valve in the dome, with chime whistles and bearings of phosphor bronze with Crosby safety valves, Krupp tires, Richardson balanced valves, and Jerome packing. Further details taken from the specifications are given in the following table:

Cylinders	19 x 26 in
Driving wheels	55 in
Boiler, Belpaire type	63 in
Boiler pressure	180 lbs
Waist sheets	9-16 and ⅝ in
Throat sheet	⅝ in
Front flue sheet	⅝ in
Longitudinal seams	Quadruple and quintuple riveted
Rivets, diameter	1 in
Tubes, number of	250
Tubes, diameter of	2 in
Tubes, length of	11 ft. 1 in
Fire-box	sloping between frames
Fire-box, length of	98 in
Fire-box, width	32 in
Grate area	21.1 sq. ft
Water space, back and sides	3½ in
Water space, front	4 in
Staybolts, spaced not over	4¼ in
Wheel base, rigid	14 ft
Wheel base, driving	14 ft
Wheel base, engine	21 ft 6 in
Wheel base, total	49 ft
Weight on drivers	114,000 lbs
Weight on front truck	16,000 lbs
Weight of engine	130,000 lbs
Weight of tender	85 lbs
Guides	two bar Laird cross-heads of cast steel
Slide valves	Richardson balanced
Driving wheels, cast iron centers, diameter	48 in
Tires, Krupp crucible steel, thickness	3½ in
Driving wheels, front and back pairs flanged, tires,	5½ in
Driving wheels, main, plain	6½ in
Driving axle journals	8 x 9 in
Driving axles	Hammered iron
Cylinder lubricator	No. 9 Nathan
Injectors	No. 9 Monitor and No. 9 New Nathan
Cab	Ash and pine
Pilot	Oak braced with iron
Tender frame	10 in. steel channels
Tender wheels, Krupp tires	33 in
Tender axles, hammered iron, journals	4¼ x 8
Capacity of tank	4,000 gal

THE FUTURE OF THE EXPRESS LOCOMOTIVE.

Under the above caption the Practical Engineer briefly expresses opinion of the direction which improvements in locomotive designing are to take in English practice. Our readers are posted as to the advantages to be derived from liquid fuel burning and also as to the limitations of this fuel in this country. It will be of interest to see what suggestions will be made by the journal referred to with regard to the employment of superheaters upon locomotives. The statements made are as follows:

Express locomotives are continually being called upon to take heavier loads at higher mean speeds, and up to the present can hardly be said to have been found wanting. The opinion is, however, frequently expressed that if the demand goes on increasing, as it is still doing, it will be necessary to resort to electric traction. Nevertheless, on our part, we are inclined to think that this stage has not yet been arrived at, and we shall endeavor in this article to point out in what directions improvements may still be made.

An increase in the output of any steam engine necessarily involves an increase in one of two factors—we must either increase the amount of fuel which can be burnt without loss of efficiency, or we must increase the thermal efficiency of the engine.

With regard to the first point, the consumption of coal per square foot of grate is already about as high as possible, and we do not see how it can be increased, as any increase in the draft would simply lift the fire from the bars. Nor can the grate area be increased to any great extent. A grate about six feet six inches long is about as much as can be fired efficiently and with due regard to the difficulties peculiar to locomotive firing. The only way of increasing the width would be to raise the grate above the frames, and this is hardly feasible with our small structure gage.

The only method which we can see of increasing the amount of heat generated is to use oil as fuel instead of coal. The difference in price is small, and there would be no very great difficulty in designing a suitable boiler. To allow for the higher temperature to which the fire-box would be subjected some structural alterations would, no doubt, be desirable. But this difficulty is by no means insuperable. The tubes might be made less in diameter and the number increased, thus increasing the heating surface, as they would not be liable to become choked with ashes as they are with a coal fire. It might be found possible to use water tube boilers, but at this point the matter becomes rather too speculative to speak with any degree of certainty.

With regard to the question of economy, we think that compounding can hardly be said to have been very successful, nor is this surprising when we consider the very variable demand on a locomotive, both as regards power and speed. In cases where these factors are comparatively speaking uniform, no doubt compound locomotives may attain some degree of success, but these conditions are the exception, and not the rule. Nevertheless, as at least 40 per cent of the water is not shown on the diagrams, there is a very large saving to be accomplished if we can do away with cylinder condensation. We believe that the only solution of this problem lies in the use of moderately superheated steam.

A number of inventors appear to consider that the large compression shown on locomotive diagrams is undesirable, and have designed valve gears to give an early cut-off without such a compression. This is, however, a mistake. The clearance spaces in a locomotive are necessarily larger than in a stationary engine, and unless filled by the compression would be a great source of waste. Also, when we consider that the moving parts are made heavy, to stand the shocks and rough usage to which they are subjected, and that the piston speed is often as high as 1,400 ft. per minute, we see that the compression is not only quite, harmless, but it is an absolute necessity. On the whole, there appears to be little to be desired in the way of improvement in the distribution of steam.

Piston valves will in all probability become general. The work expended in moving the ordinary valves is a very variable quantity, but is never by any means negligible. This has already been done by several companies with very promising results.

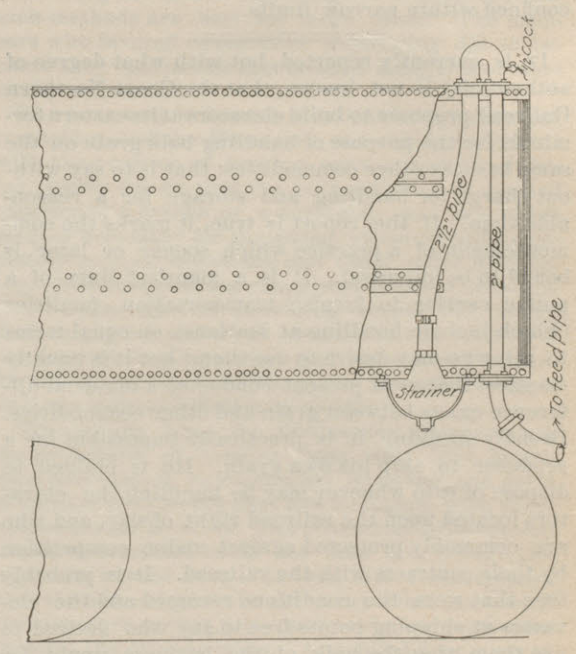
It will be seen from the above that the two most promising directions in which an improvement may be sought are in the use of superheated steam and liquid fuel. With superheated steam the pressure might be increased considerably, as the degree of expansion obtainable in one cylinder is by no means so restricted as with saturated steam.

In conclusion, we may say that we do not agree with those who propose to increase the number of cylinders or make other fundamental alterations in the general arrangement. Simplicity and accessibility of parts are always sacrificed in such designs, though their value can hardly be overrated. Any change will, we are sure, be a growth, and not a revolution.

SUCTION PIPE FOR LOCOMOTIVE TANKS

A new suction pipe for the tanks of locomotive tenders has been devised and patented by Mr. Chas. Linstrom, master mechanic of the Yazoo & Mississippi Valley Railroad Co., with a view of overcoming some of the difficulties which are incident to the use of tank valves of various forms. The method of constructing this suction pipe is shown in the accompanying illustration where it is seen to consist of a siphon bend in the suction pipe the loop of which projects through the top of the tank. The water for the injectors passes from the tank into a basin shaped receptacle or well which is secured to the under side of the tank, and into which the water passes through a strainer. From the top of this basin, a 2½ inch pipe extends upwards and connects with the return bend at the top of the tank. To the out-going end of this bend, a vertical 2 inch pipe is connected, which passes down through the leg of the tank and is connected to the hose leading to the injectors. In the return bend, a ½ inch cock is provided, which permits the admission of air into the suction pipe, so as to prevent the water from siphoning out of the tank in case the engine is disconnected from the tender. The basin or well is provided with a plug which may be removed for cleaning.

The water in the tank may be withdrawn for boiler feeding by starting the injector which will be done by any suitable lifting injector. It will be seen that the water in the feed pipe and the hose can readily be forced back into the tank by the use of the injector which will leave no possible chance for freezing up the connections, the device itself being protected from freezing by being placed inside of the tank. The cost of equipping a tank with this apparatus is stated to be about one third of that of the cheapest valve arrangement, and it is apparent that with no working parts except the air cock, which is insignficant, that the apparatus should last as long as the tank. It is obvious that with such a device the strainer may be made as large as desired and that the passage for the water may be made ample so as to reduce the friction in the pipes to a minimum.



FEED PIPE FOR LOCOMOTIVE TANKS.

THE RAILWAY REVIEW

OFFICE OF PUBLICATION:

The Rookery, - CHICAGO, ILL.

Eastern Office: 189 Broadway, New York.

TERMS OF SUBSCRIPTION:

Per Year..... $4.00
Foreign Subscription (including postage)..... 5.00

Convenient binders sent postpaid for $1.00.

PUBLISHED EVERY SATURDAY: Subscribers are requested to give information of any irregularity in receiving THE REVIEW.

Rates of advertising made known on application.

All remittances should be by Draft, Express, or Money Order, payable to THE RAILWAY REVIEW.

Address all communications to THE RAILWAY REVIEW Rookery, Chicago.

CHICAGO, SATURDAY, OCTOBER 24, 1896

THE iron trade advanced a notch under healthier influences. There were rumors a few days ago of speculative transactions in pig iron. Steel billets are dull and weak. Steel rails unsalable except in small lots. Iron bars are weak and mills are not more than half employed. Inquiries for shapes and plates indicate large purchases before the close of the year, and it now appears probable that large blocks of construction material will be contracted for before the midwinter season. Careful inquiry in railway circles within a few days shows this to be the condition of things: that there are large and urgent necessities pigeonholed for action as soon as traffic warrants, as well as settled conditions in other directions. The enormous productive capacity of furnaces and mills insures cheap material for 1897. Recent improvements in steelmaking for particular uses call for attention. Vigorous efforts will be made to unite the various branches of iron and steel makers in their respective channels to secure the advantages of the rising market so generally anticipated next year. Despite any organized effort, however, the hardening of prices must of necessity be confined within narrow limits.

IT is currently reported, but with what degree of authenticity is not known, that the Great Northern Railroad proposes to build elevators at its eastern terminals for the purpose of handling bulk grain on the same basis as other commodities; that is to say, without charge for handling and storage for a reasonable time. If the report is true, it marks the commencement of a practice which sooner or later is bound to be universal. It is a manifest duty of a public carrier to furnish transportation facilities (which include handling at stations), on equal terms to all who may desire to use them; but it is equally manifest that as at present conducted a material difference exists between grain and other commodities. Broadly speaking it is practically impossible for a producer to ship his own grain. He is obliged to dispose of it to whoever may be handling the elevators located upon the railroad right of way, and who are commonly protected against undue competition by their contracts with the railroad. It is probably true that were the conditions reversed and the elevators at shipping points free to any who desired to use them, that the bulk of the business would for some years at least, be handled very much as it is at present; but that does not alter the obligations that exist. Whatever facilities are necessary for the conduct of the business should be provided, and sooner or later it will be found that grain handling is included in this category.

THE advantages to be derived from reducing the number of cars in a train, made possible by increasing the capacity of the cars, has given rise to a number of designs of 70,000 and even 80,000 pounds capacity, by using the ordinary materials for car construction and with practically no increase of the amount of metal employed. There is no doubt of the superiority of higher capacity cars but the policy of building them in wood is perhaps worth thinking over. It would seem advisable to consider the question as to whether the ends which these large capacity cars are intended to meet would not be better attained with the use of steel in place of wood. The very best wooden construction for a 70,000 or 80,000 pound capacity car will in all probability not offset the increased wear and tear due to the heavier loading to which they will be subjected, and ample evidence may be had showing that cars of much greater capacities than those mentioned may be built in steel, which will also give a greatly increased length of service over the present cars with their comparatively light loads. A builder of steel cars stated before the Master Car Builders' Association at its last convention, that placing the cost of a 60,000 pound wooden car at $\frac{3}{10}$ or $\frac{1}{4}$ of a cent per pound of carrying capacity, a steel car of 80,000 pounds capacity can be built for $\frac{33}{40}$ of a cent per pound of carrying capacity. It would seem to be abundantly worth while to give the steel construction an opportunity to show its possibilities as to cheapness of repairs, and also to demonstrate what effect the advantage of using a much smaller number of cars for the same business would have on the earnings of the roads. Certainly the durability will be favorable to the steel construction, and it is equally sure that the loads may be increased to a higher point with this than with wooden construction.

ONE of the most common as well as universal notions that possess the minds of shippers, appears to be that railroads are or should be constructed and operated for the particular benefit of their trade, regardless of the results to the railroads. The fact that some traffic will not bear long distance transportation never seems to occur to them, and they demand with the utmost assurance that their product, whatever it may be, shall be transported at such rates as will enable them to compete with local producers in all sections of the country. When the trans-continental roads first inaugurated a lumber rate that would permit the laying down at Central and Eastern states points the better class of lumber produced upon the coast, the additional market thereby made available was hailed with delight and eagerly availed of, but with the growth of the trade came new demands and the roads are now being importuned for, and in some cases berated because of their refusal to make, a rate sufficiently low to permit these producers to ship the lower grades of lumber to eastern markets in competition with local product. It is claimed that a forty cent rate should be made for this purpose, but it is not shown how such a rate can be maintained with any profit to the roads. In view of the very common practice which has heretofore prevailed among railroads it must be confessed that abundant reason exists for the prevalence of this idea among shippers, but it is time that it was corrected. Railroads were never intended to equalize markets except so far as reasonable transportation charges might offset the difference in cost of production between localities. Certainly it should never be thought that railways should place upon an equality two market separated by a distance of three thousand miles. If a wise policy prevails, Pacific Coast lumberman will never ship low grades of lumber for ordinary uses, to the Central and Eastern states markets.

SHOP PRICES.

The question of establishing piece work in locomotive and car shops is one which is giving considerable concern to many men who are in charge of these departments of railways, because of the certainty of a reduction of the cost of repair work when the incentives of piece work are offered to the men. It is more than ever apparent that great care must be exercised in the establishment of the prices in the inauguration of piece work systems, and though this caution has often been made before it is believed to be worth while to call attention to the fact that there are some shops wherein the regular day's work prices are far below some of the piece work prices which have been quoted. For instance a case comes to mind of a comparison between the cost of pressing car wheels onto and off of axles, between two shops one of which used piece work and the other did not. On account of a request not to quote the exact figures, only the proportions between them can be given but this will serve the purpose.

In the piece work shop the price for pressing off a wheel was say 14 cents and the price for pressing one on was 18 cents. These figures are of course absurdly high for the reason stated. In the other shop it was desired to start a piece work system on the wheel job and the cost of the work for the previous year was taken as a basis and prices of say 9 cents for pressing off a wheel and 12 cents for pressing one on were made. It will be noticed that the prices last quoted are about one-half of the piece work prices, and the conditions being practically the same in both shops, there seems to be no good reason for the difference except that the piece work prices were not established on a correct basis. As the lower prices were found to be entirely satisfactory, it will become necessary in time for the higher prices to be changed. This is one of the objections to piece work which exist in the minds of the men who say, and often justly, that the minute they begin to make good wages their rates are cut. This does not constitute an objection to piece work, but merely to the usual method of establishing the prices and making them so high that a change is necessary. This is such a common occurrence as to justify the remark that frequently piece work prices are established by guesses rather than by careful consideration of all of the items which should go to make up the price.

In contrast to the usual method, is a plan which is meeting with perfect success in several shops, which consists of establishing a proper price to start with and one which does not need to be changed except upon the introduction of new methods in the manufacture which change the elements upon which the price is based. In one large shop which is being gradually turned into a piece work shop, a man is detailed to watch the different items of work for a year or so and to ascertain the capabilities of the men with sufficient exactness to admit of placing a price on the different parts of the work which will permit the men to materially increase their wages, and at the same time will urge them to their utmost endeavors to turn out the maximum amount of work. The result has been that the men are entirely satisfied and they are given a constant incentive for which they are rewarded and the gain enjoyed by the company is in the increased output. In numerous instances it has been found necessary to raise the rates and in all cases, in the shop last referred to, a guarantee was offered the men, that under the new system the wages for an established day's work should not fall below the former day rates. It is easy to raise the rates to such a degree as is necessary for the best stimulation to the men and if they are put sufficiently low at first to admit of this, there will be fewer mistakes made and less money lost through job nursing. Piece work shops may be pointed out in which a large amount of time is occupied by the men in ways which are useless to the company because they dare not make over certain wages per day. It is obvious that such systems are wrong and only operate to the advantage of one of the parties, the correct basis being one whereby both the employer and employe profit equally by the change.

STANDARDIZING SMALL PARTS OF CARS.

In discussing the topic of large freight cars at the February meeting of the New York Railroad Club, Mr. D. L. Barnes, in speaking of the increasing use of steel underframes for freight cars, stated that he had come to the conclusion that no standard of details of the woodwork of cars would ever be agreed upon by the Master Car Builders' Association, but that when steel underframes are introduced the difficulty of obtaining material for construction and repairs will compel the use of standard shapes and lengths of rolled sections. In this a precedent has already been established by the Association of American Manufacturers, who are producers of structural shapes and who have come to an agreement limiting their product to certain sections which have been agreed upon. The result of this agreement is that the number of sections which they will carry is reduced to about one-third of those which

had formerly been made. The object of this action was to reduce the lost time occasioned by waiting for parts and to facilitate deliveries of material for repairs. The relative ease with which wooden parts may be constructed and trimmed down from larger pieces does not render these members subject to the same treatment, so that probably Mr. Barnes is correct as to the standardizing as far as woodwork is concerned.

The topical discussion before the Master Car Builders' Association at the last convention, upon the following question is appropriate in this connection: "Is it desirable to have greater uniformity in car construction? If so, are there other parts of freight cars that could wisely be standardized? What parts is it most desirable to so standardize?" In this discussion attention was called to the fact that at present standards apply to some details of truck construction and to certain features of brake beam and arrangement of the air brake and its details. The contour lines of the coupler and the arrangement of buffer blocks and their location are provided for by regular standard and recommended practice, but there the good work has ended. It is questioned whether more parts could not with advantage be placed in the list and among those which have been suggested and which seems to be eligible are centerplates, certain parts of the draft rigging, such as the lugs, and also the arch bars of trucks. It would perhaps save trouble if the sizes of these bars were established. If the lengths should vary it would be a simple matter to carry iron of a proper size in stock to be cut off at the length desired; and there seems to be no reason why an agreement as to the cross section should not be reached.

There is a feeling held by many people that standards interfere with progress and prevent the proper advantages from being derived from improvements which may from time to time be introduced. This, however, does not seem to be a good reason for not carrying out standards in a number of small parts of cars, of which now a large variety of sizes and shapes are used. The rapidity with which rolling stock wears out, would not place such standards in the way of adopting new and improved methods, whenever they are sufficiently well worked out to demonstrate their advantages over the old. It is not unlikely that this idea will be better developed with the increase of steel in car construction for the reason already alluded to. For in this construction standardizing is admitted to be necessary on account of the difficulty of handling this material if it is in odd shapes, and the delay which would be caused by the necessity of procuring specially prepared parts.

The recent discussion on the subject of the difficulties which has arisen in connection with the new interchange rules before the Central Railway Club, shows that a great deal of trouble is being occasioned by the use of wrong material in repairing cars, and while some of this trouble might be avoided, by a closer adherence to the present standards and recommended practice of the Master Car Builders' Association, there is yet a good deal to be accounted for by the great variety of shapes and sizes of the ordinary small parts, and if those who are advocating the adoption of a standard car as a whole, would begin with the small details, real good might be accomplished with comparatively little trouble. Some time ago, a contemporary quoted a superintendent of motive power as saying that he had found in one of his repair yards that a repairer carried a stock of sixteen brake ratchets, and when found fault with for keeping so many on hand, the explanation was made that no two of them were alike, which is typical of quite a large number of other parts used about cars. These may be insignificant items when taken singly but there is no doubt of the fact that some good work may be done in simplifying matters of this kind. The ideal would be a standard car which would be like every other car but that is not to be looked for or even hoped for with the material used at present.

THE PASSENGER MILE UNIT.

In a recent issue of this journal, some observations were made upon the futility of continuing the use of the "ton mile" as a factor in railroad statistics. The article has excited some little comment among railroad men and the accuracy of the statements therein made has been generally admitted. That the danger resulting from its use was not over estimated is likely to be amply verified during the coming winter. This ton mile or rather its corresponding unit, the passenger mile, is likely to be made a subject of legislative investigation and in view of this fact it may be well for traffic men to determine just what their attitude will be in such a case. The clamor for a two per cent per mile rate has been so long continued, and is becoming so urgent, that legislatures cannot, or will not longer ignore it, and some passenger officials are already casting about for information upon which to base their contention that such a rate would be ruinous. It seems to be a well settled proposition in the minds of railway men, that passenger rates should approximate three cents per mile in densely populated sections, and from one to two cents higher in more sparely settled localities, but just by what process of reasoning such a conclusion is arrived at, is somewhat difficult to state, supposing of course that the figures are intended to represent a fair return for the service rendered. Who at the beginning of the railroad era inaugurated the idea, and who perpetuated it, that three, four and five cents per mile was sufficient compensation for a railway company to haul a passenger? And who knows, at this time, whether the railroad companies cannot carry passenger at one or two cents per mile at a fair profit above expenses? And who shall say what a fair profit shall be ? In the old stage coach days any figure from ten to twenty-five cents per mile was a customary charge. Was the price then collected based upon the known cost of the service with an unknown (at least now unknown) profit added thereto?

If a railway company has to pay an average of six of seven per cent per annum for interest on its bonds issued at a time when everything cost more than now but which do not arrive at maturity for five, ten or twenty years hence, and should pay seven per cent and four per cent for dividends on preferred and common stock respectively, in addition to taxes, insurance and general operating expenses, it would seem that a difference of twenty-five per cent between the revenue from passenger train service and the cost of operating such service might be considered a fair return or profit, and the passenger rates made to the public upon such a basis. But how shall the percentage of profit be ascertained?

Every railway auditor knows how much are the gross annual receipts from passenger service. He knows from his carefully kept statistics, how many miles are run by passenger trains, how many passengers are carried, and how many passengers have been carried "one mile", and what the average revenue per mile is. But he does not seem to know exactly or even approximately, how much it has specifically cost to run the trains carrying passengers, or how much is the actual or even average cost of carrying a passenger "one mile". His statistics are lacking in this most essential quality and not being able to show definitely the cost of the service, he is unable to inform the traffic officials what is the proper rate to be charged for carrying passengers in order to produce a profit on the traffic. It is at this point that ignorance, as dark as darkest Africa prevails.

With such a lamentable state of affairs existing how are the railway officials successfully to combat the efforts of commercial travelers, and others to induce state legislatures to reduce local passenger rates below the present tariffs? Given an ordinary local rate of three cents per mile for the occasional traveler, a mileage rate of two cents per mile for the long distance traveler, an excursion rate of one and one-half cents per mile for special occasions, and a commutation rate of from one-half cent to one and one-half cents per mile for the every day suburbanite, who can say whether these figures, or an average of them, will pay any margin above expenses of passenger train service, or whether the passenger traffic is conducted at a loss.

Is there a Solomon in the land who will rise up and inform the railway managers—and the public—how much is the average cost of carrying a passenger one mile? The importance of this matter must not be underestimated. The question is going to be asked and legislative committees next winter will not be satisfied with "I don't know," for an answer; and in view of the fact that the passenger mile unit has been so long used by railroads as a basis they will be justified in expecting a better one. Meanwhile if managers are wise, both of the misleading and mischievous terms will be eliminated from the railroad vocabulary.

THE ASSOCIATION OF RAILWAY SUPERINTENDENTS OF BRIDGES AND BUILDINGS.

The sixth annual convention of the Association of Railway Superintendents of Bridges and Buildings was opened at the Leland hotel, Chicago, on Tuesday, October 20. Prayer was offered by Mr. J. H. Cummin, after which an address of welcome was delivered by a representative of the mayor of Chicago, which was responded to by President McGonagle. At the calling of the roll, 26 members answered to their names, and afterwards a number of others came in. The usual preliminary business was transacted and reports by the secretary and treasurer were received. The membership was shown to be 221, to which 18 new names were added at this convention. The report of the treasurer showed that the receipts for the year amounted to $1,081.72, the expenditures $848.06, leaving a balance on hand of $233.66.

At the afternoon session of the first day, committees were appointed on auditing, nominations, subjects for discussion, obituary and resolutions. After these appointments, reports of committees were read and unfinished business was disposed of which included the discussion of the reports of the last meeting. The discussion of Wednesday morning was devoted to the newly presented reports of which the first was by the committee on the question, "Should all water ways be numbered?" This report presented a number of statements of the practice on different systems and concluded with the recommendation that the best system for numbering is one that is consecutive and simple, and the committee raised the question as to whether all waterways should be numbered and provided with signs, or whether only the larger openings should be so treated. In the discussion of the report the balance of opinion seemed to favor a mileage system of numbering, and it was also noticeable that a number did not favor placing numbers upon openings which the road department maintained. Mr. McGonagle of the D. & I. R. Ry. described the system in use by him in which the bridges on the main lines were numbered by the mile, a prefixed letter being used to denote a branch and an affixed letter giving the order of the bridges which might occur in any particular mile. A substantial sign of wood or iron of as permanent a nature as possible was generally favored, these to be placed upon the engineer's side of the track and to carry letters in the neighborhood of 6 in. in hight.

Few of the members use the mileage system in which the miles and tenths of miles were used in numbering the structures, though it was agreed that such methods are best for large roads. The members who favored consecutive numbering did so because they considered this method simpler and more easily understood.

The next subject treated was drawbridge ends and turntables, and the discussion was chiefly connected with the question of locking such structures, it being clearly shown that the only satisfactory method of securing a bridge or a turntable was one which made it necessary for the swing structure to be completely stopped before the bolt could enter for locking. The report of the committee directed attention to the importance of providing proper rail raising devices, good methods of connecting the rails from the draw to the abutments, and satisfactory latches for bridges which were not heavy enough to stay in line on account of their own weight.

The opening topic for Wednesday afternoon was the protection of trestles from fire. The report upon this subject recommended covering the parts of trestles such as the caps and stringers, with sheet iron of No. 20 B. W. G. The committee believes that trestle so protected could not take fire, though ties might be burned away. It was also recommended that the sod and grass be cut away from the base of the structure so that fire could not be communicated through the piles or bents. A planked floor covered with a thin layer of ballast was also recommended. In the discussion of this report, some experience was described with the use of ballast floor and sheets of metal, but the majority of the speakers found no precautions necessary beyond providing the usual water barrels and cleaning up the ground under the structure. Mr. Onward Bates of the Chicago, Milwaukee & St. Paul Railway stated that in districts where there was unusual liability to fire, special watchmen were provided to patrol the trestles and in other cases the trackmen looked after them in this respect. He provided water barrels in which buckets were placed and was specially careful in cleaning up around the structures.

The report of the committee upon the subject of "Local Stations at Small Towns and Villages," presented 39 plans of stations and platforms, which were received from members in reply to a circular sent out by a committee. The discussion of the subject centered in the arrangement of waiting rooms in stations and the proper hight of platforms. The general opinion seemed to favor a single waiting room in place of two which are often furnished, though it was stated by members from the southern roads, to be necessary on parts of their lines to furnish separate rooms for colored and white passengers. As to platforms, a number of the members reported excellent results from those constructed of brick although the majority appeared to be using wooden construction. Considerable time was spent in considering the relative advantages of high and low platforms. On the afternoon of the second day, the subject of tanks and water stations was considered, including the question of frost proofing and the arrangement of the connections between the tanks and standpipes. The employment of larger pipe connections and standpipes, as large as 10 in. diameter was urged because of the long time required for filling locomotive tanks if the connecting pipes and the standpipes were of small diameter. The use of white pine was not recommended for tanks and material thicker than 2 or 2½ in. was not considered desirable. The question of the cost of foundations and of erecting tanks was also discussed at considerable length, after which the matter of blank forms was taken up in connection with a report upon the subject.

The morning of the last day was taken up with the closing business of the session, the election of officers and determination of the place for the next convention. The majority voted in favor of Denver, Colo., and the election of officers resulted as follows: President, Mr. James Stannard, Wabash R.R.; first vice president, Mr. Walter G. Berg, Lehigh Valley R.R.; second vice president, Mr. J. H. Cummin, Long Island R. R ; third vice president, Mr. A. S. Markley, C. & E. I. R.R.; fourth vice president, Mr. R. M. Peck, Mo. Pac.; secretary, Mr. S. F. Patterson, B. M. R.R.; treasurer, Mr. N. W. Thompson, P., Ft. W. & C. Ry. The following members were elected as executive committee: Mr. W.O. Eggleston, chairman; Mr. M. Riney, Mr. C. P. Austin and Mr. G. J. Bishop.

After the close of the session, the members enjoyed several excursions to points of interest in the neighborhood of Chicago which occupied the afternoon of Thursday and the whole of the day Friday.

Among the exhibits was a standard section hand car, by Fairbanks, Morse & Co., together with a motor car, jacks, and drawings of the standard pipes and tanks and other equipment furnished by this concern. The hand car exhibited has cut gears with an adjustment for taking up lost motion in the crank connection, it has steel wheels, held on conical wheel seats by nuts without the use of pins. The driving gear and the pinion are secured to their shafts in the same manner. The gasoline motor car which was exhibited, is one which has made an excellent record on a number of roads, the cost of operation being but one cent per mile when carrying two or three persons. This exhibit also included an excellent photograph of the new gasoline pumping engine which has been placed upon the market by this firm. This exhibit was in charge of Mr. C. F. Pierce.

The exhibit of the Buda Foundry & Manufacturing Co. consisted of one of the new Buda steel-wheel velocipedes, which has propelling mechanism in the form of a friction device which engages the axle only when the car is being driven. There are no cranks and no dead centers with this construction. This exhibit was under charge of Mr. F. A. Ingals.

Mr. O. A. Bogue represented the Bogue & Mills system of railway gates.

The Stilwell-Bierce & Smith-Vaile Company was represented by Messrs. W. H. Ingraham and A. E. Bowler This exhibit consisted of track jacks, a model of a water stand pipe, and a pump. A number of interesting samples of boiler scale were shown, which had been taken from feed water heaters, furnished by this company, and which are designed to remove all of the scale producing substances from feed water before the water reaches the boiler. This company is now engaged in putting in a complete electric equipment consisting of a turbine wheel plant and a transmission line thirty miles long for obtaining power from the Lachine river near Montreal. This plant is to transmit 20,000 horse power.

The American Hoist & Derrick Co. of St. Paul, Minn., exhibited a number of photographs of hoisting machinery.

Several paint concerns were represented, among which were Sherwin-Williams, The Jamieson Fire Resisting Paint Co., and Messrs. Vilas Brothers, manufacturers of iron paints, were represented by Mr. W. B. Parker.

CAR HEATING BY STEAM.*

By Mr. R. M. Dixon.

Those who are operating steam heat on trains well know the conditions which should be met, and how well the appliances used fill the requirements, what troubles are encountered and how they are overcome. An inquiry amongst those having charge of equipment on cars shows that success is almost universal, so few troubles occur. There seem to be but few instances on any road during entire seasons, and almost all trouble can be traced to either lack of steam circulation in the train pipe, or to insufficient attention to the drips or traps. Cars cut out of trains sometimes have pipes freeze, but this is always due to neglect in opening drainage valves.

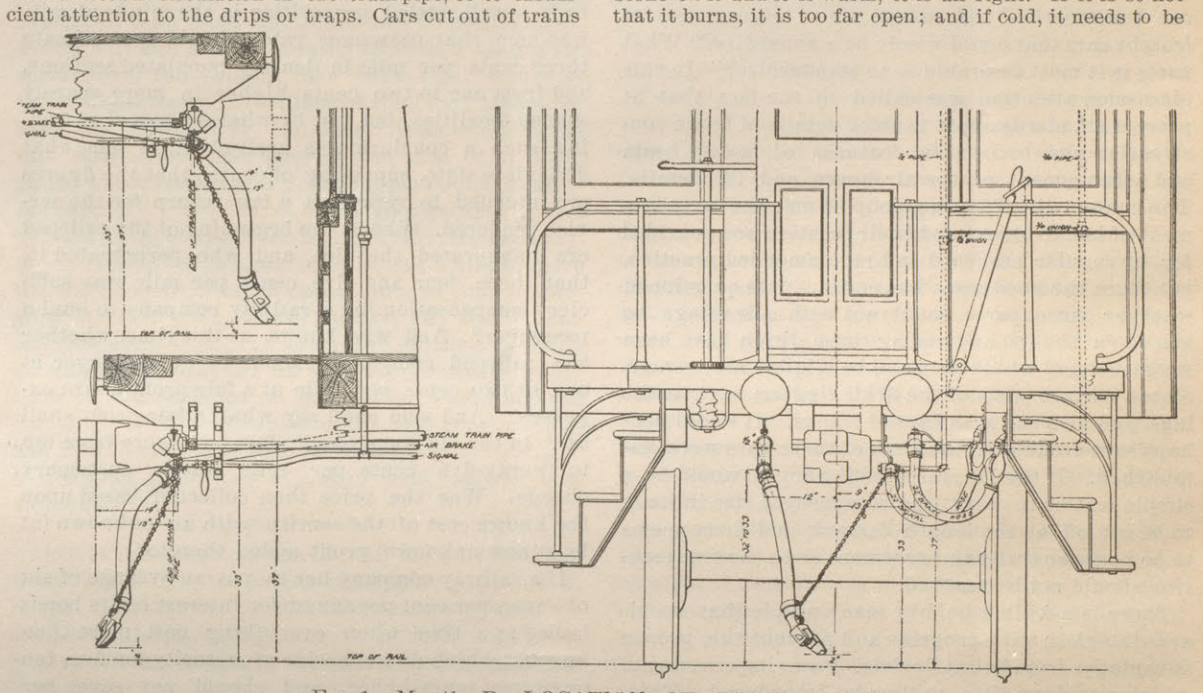


Fig. 1.—M. C. B. LOCATION OF TRAIN PIPES.

Train pipes, as used for all couplers, should have their ends conform to the Master Car Builders position for direction and location. This location is shown by the accompanying illustration, Fig. 1.

It is well to bear in mind in placing them that the tendency of the ends of cars is downward, and as the couplers, if hanging uncoupled, will almost strike the switch, tracks, and crossings, the end of the train pipe should be placed above rather than below the standard position. The train pipe should drain from the point where the car supply is taken off, to its ends. If it cannot be done and keep the train pipe below the floor sheathing, then a first class plan is to run it between the car sills and above the sheathing. In such a place, covering but ⅝ inch thick, will suffice; while if below the sheathing, covering 1 inch thick is advisable. The arrangement of the train pipe above the sheathing is standard on some roads, and it has much to recommend it. The cross bracing between the sills has to be bored, and therefore the number of such braces should be increased.

Such train pipe cocks should be used as are readily understood on sight. There is but little time to study out a system when a train is ready for service, and experience teaches that train pipe cocks are the part of the equipment most difficult to understand. In service all train pipe cocks but one, the rear one, are to be open, and in cold weather the rear one should be open enough to let just a little steam escape through it so as to maintain a circulation of steam throughout the train pipe, whether or not the rear cars are using steam. This is the practice on many railroads, and seems to be desirable in very cold weather.

The covering should be well applied to the train pipe; otherwise it will not stay on. Instances can be cited where the covering has remained in place but a short time and more than one-half the train pipe become exposed and in condition to cause more condensation than all the radiating surface in the car.

As to the amount of direct steam-radiating surface in a car, experience has led to the use of two 2-inch standard iron pipes along each side. This is somewhat below what heating engineers would figure as necessary to keep the cars warm in zero weather; but as more has been found very excessive for moderate weather, a sort of compromise has resulted. The only way to satisfactorily warm cars by direct steam in all kinds of weather is to have appliances that will permit of varying the amount of radiating surface into which steam is supplied, and so approximate to a suitable heating surface to meet the conditions existing. Such an arrangement also permits of quickly heating cold cars, without overheating them when warm.

All valves and fittings placed inside of the cars should be heavy, and not liable to leak or have the bonnets come off when opening. The valves should have their use cast plainly on the handles.

For direct steam, an automatic trap for disharging the condensation is not necessary, nor desirable. The amount of condensation to be discharged after a car is warmed varies but little, and any increase or decrease of condensation is in the same direction as the change in steam pressure within the radiating pipes. Therefore, an orifice adjusted to take care of the condensation at any pressure will discharge a greater amount of condensation when there is a greater pressure to expel it.

Angle valves are usually used for drip valves, and in many cases have been so arranged as to prevent their being entirely closed. Experience has taught that it is better not to so arrange them. A very simple and safe method of adjusting the drip valves properly was given by Mr. A. M. Waitt, general master car builder, Lake Shore & Michigan Southern Railroad, when discussing this subject before the Central Railroad Club. He instructs to just touch the hand to the drip valve, and if the hand can be borne on it and it is warm, it is all right. If it is so hot that it burns, it is too far open; and if cold, it needs to be opened a little.

With hot-water circulating systems for distributing the heat throughout the cars, the regulation of the temperature is quite easy, and the heat can be carried to various parts of the car without the multiplication of drips for the condensation that is required for direct steam. The various appliances used in hot-water circulating systems are familiar to all and need not be described. There is no trouble in giving to the circulating water by steam a far higher average temperature than is given by the Baker heater, or necessary to heat the cars.

It is desirable, in conjunction with water circulating systems, to use some kind of a device for discharging the condensation, which device shall be in a degree automatic. The rate of condensation is quite variable, and generally the drip is located under the car where it cannot receive close attention. If not automatic and adjusted to discharge sufficiently while heating the circulating water and raising the temperature of the car, it will be too much open after the water is hot and the car warm, and much steam will be wasted, causing not only loss of steam, but damage to car floors and varnish as well as annoyance around the cars.

The following set of rules for handling steam equipment may be found reliable, especially if supplemented by a description of the system in use, and modified as the system may require.

RULES FOR MAKING UP TRAINS.

When a train is made up, all steam hose should be coupled, and all the cocks in the steam train pipes the whole length of the train should be opened.

When signal is given, steam should be turned on at the cab, not to exceed 65 pounds, and allowed to blow through the entire length of the steam train pipe.

After steam issues at the rear end of the train pipe, the rear cock of last car should be closed, and reducing valve in cab set to 40 pounds pressure. If more than eight cars are in the train, add 5 pounds for each additional car. In very cold weather the rear train-pipe cock should be left open enough to allow a little steam to pass and escape through the rear coupling.

REGULATION OF TEMPERATURE.

To heat cars, open steam inlet valves on each car; and when live steam appears at the drips, set each drip so a little steam escapes with the water. If a trap be used, see that it is adjusted to allow a little steam to escape with the water.

Frequently examine traps and drip valves to see that they are operating properly. They should be as hot as can be borne by the hand. If cooler, or cold, they should be opened a trifle; or if too hot, or steam is blowing, closed a little.

Never close steam inlet valves entirely without first opening drip valves or blow-off valve, and allow water to blow out before closing steam inlet valve.

When steam is required on this car again, open steam inlet valve, and afterwards close drip valves or blow-off valve.

CHANGING ENGINES.

When approaching stations where engines are to be changed, or terminals where cars are to be laid up, five minutes before arriving at such stations the rear train

*From a paper read before the New York Railroad Club October 15, 1896.

pipe cock must be opened wide, and before coming to a stop at such stations the engineer must shut off steam at boiler valve. Do not use reducing valve for this purpose.

If engines are to be changed, trainmen must satisfy themselves that steam is shut off at engine before uncoupling cars.

In freezing weather, if cars are to be laid up, or stand thirty minutes after engine is uncoupled, the hose throughout the train must be uncoupled, and all drip valves or blow-off valves opened.

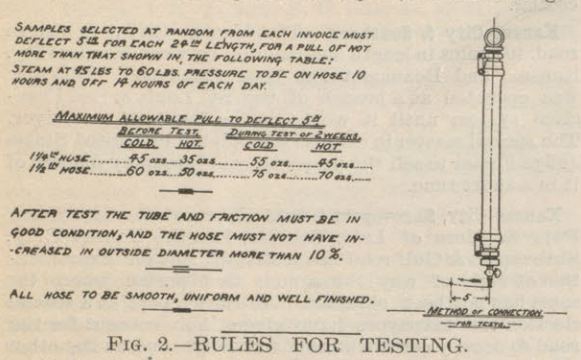


FIG. 2.—RULES FOR TESTING.

The greatest expense of maintenance of steam equipment is the renewal of the coupling hose. The set of specifications and rules given in Fig, 2 for testing are reasonable, and have been found to give good results. At least one per cent of each lot of steam hose should be tested.

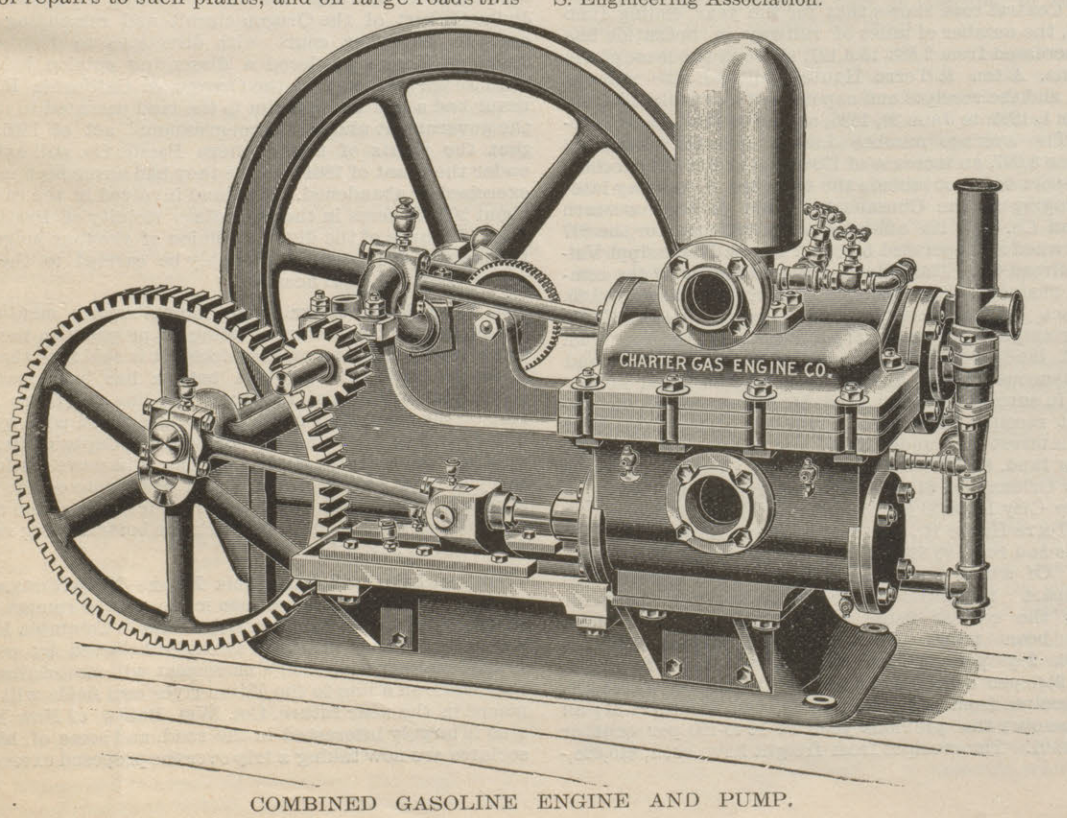
The Western Railway Club.

A regular meeting of the Western Railway Club was held October 20 at the Auditorium Hotel, with a good attendance, President Waitt presiding. The first subject discussed was the paper presented at the September meeting by Mr. J. N. Barr, entitled, "The Apprentice Boy." In connection with this subject the paper presented several months ago by Mr. H. D. Judson on "Railroad Ethics" was considered, as the subjects were somewhat allied. The discussion was interesting and it was apparent that the members considered the subject of great importance. The result of the discussion was the appointment of a committee to consider the question of the "apprentice boy" and to report in accordance with recommendations made by Mr. Barr in his paper, to the effect that the matter of the education of apprentices should be considered and reported upon by a committee which should be composed of men who could treat both shop and and general educational features. The committee is composed of Messrs. Quereau, Barr, Herr, Prof. Goss and Prof. Bull.

A report was made by the committee appointed at the September meeting to consider the difficulties which had arisen under the new interchange rules, and the remainder of the time of the meeting was occupied by a discussion of this report. For the next meeting the subjects for discussion are: "Recent developments in M. C. B. couplers," and "Recent developments in the tonnage system of rating locomotive performance," which are to be presented by committees appointed for the purpose.

COMBINED GASOLINE ENGINE AND PUMP.

The advantage of using gas and gasoline engines has repeatedly been mentioned in these columns and in the accompanying illustration a combined gasoline engine and pump is shown which seems to be particularly well adapted for use in some classes of railway service. In watering stations such a machine would do away with the necessity for the steam boiler commonly used, and in so doing materially reduce the cost of repairs to such plants, and on large roads this item is an impotant one Another advantage to be gained is that such a machine does not require the attendance of an experienced engineer and can be handled by anyone of ordinary intelligence. The station agent, his assistant or a baggage agent could easily look after one of these machines as the starting, the stopping and oiling of the machine is all the attention required. The illustration shows a plant capable of pumping 60 gallons of water per minute against a head of about 150 feet. The workmanship is good, the gears are all cut, and the pump cylinder is lined with brass. The Charter Gas Engine Co., of Sterling Ill., is the builder.



COMBINED GASOLINE ENGINE AND PUMP.

THE EFFECT OF THE BENDING OF WIRE ROPE.*

I am frequently asked how long a certain wire rope will last. This is a difficult question to reply to with any satisfaction, as the life of a wire rope may be affected in various ways, as for instance, by the duty performed, the care taken of it, the amount and degree of bending it is subjected to, its exposure to water, and more especially water containing salts and acids, etc., all of which, excepting perhaps the first, are more or less uncertain factors upon which to base any kind of calculations. The principal causes of wear are abrasion and excessive bending strains. Abrasion results in the flattening or tearing apart of the wires, while undue bending is manifested in the fracturing of the outer wires at the wearing points. More wire ropes are probably worn out from undue bending than from abrasion, owing to the fact that space very often forbids the use of sheaves of proper size, and the additional cost of large sheaves, especially in mining plants, is frequently a serious objection to their use. For good results of course, the bending strain added to the direct tension due to the load should not exceed the elastic limit of the wires. The strain due to bending is very often considerably greater than that due to the useful effort or load, and the importance of the size and proper disposition of the sheaves used is a matter that should be carefully considered in any wire rope installation.

The following table gives the stress per square inch of wire section in ropes due to bending for different ratios, R, between the diameters of the wires and sheaves, the ratios selected being those most commonly occurring in practice. The figures are taken from an article on wire rope by L. Lindsley, read before the Illinois Mining Institute, Sept. 14, 1893:

R.	Lbs.	R.	Lbs.
648	40,500	1,209.6	22,200
691.2	38,000	1,296	20,800
720	36,480	1,344	19,950
768	34,200	1,382.4	19,380
864	30,780	1,440	19,000
921.6	28,500	1,512	17,960
960	27,670	1,536	17,670
1,008	26,500	1,555.2	17,390
1,036.8	25,940	1,584	17,100
1,080	24,800	1,612.8	16,820
1,152	23,370	1,680	15,960
1,200	22,230	1,728	15,680

*From a paper by Mr. Wm. Hewitt, read before the U. S. Engineering Association.

In ordinary wire ropes the ratios between the diameters of the rope and the individual wires are approximately as follows:

7 wires to the strand . . . $\frac{1}{9}$
12 wires to the strand . . . $\frac{1}{12}$
19 wires to the strand . . . $\frac{1}{15}$

The transmission of power by wire ropes is effected under most favorable conditions when the useful effort is one-third and the bending stress two-thirds of the elastic limit of the material. Taking the elastic limit of tempered steel, such as used in the best rope at 57,000 lb., and that of Swedish iron at one-half this, or 28,500 lb., the corresponding diameters of sheaves in inches are given in the following table.

Diam. of Rope.	Steel. 7-wire.	Steel. 12-wire.	Steel. 19-wire.	Iron. 7-wire.	Iron. 12-wire.	Iron. 19-wire
¼	19	14	12	40	30	24
5/16	24	18	14	50	38	30
⅜	29	22	17	60	45	36
7/16	34	25	20	70	53	42
½	38	29	23	80	60	48
9/16	43	32	26	90	68	54
⅝	48	36	29	100	75	60
11/16	53	40	32	110	83	66
¾	58	43	35	120	90	72
⅞	67	50	40	140	105	84
1	77	57	46	160	120	96

It appears from this, contrary to the ordinary belief, that iron rope requires larger sheaves than steel rope does. This is due to the fact that iron wire, while having the same modulus of elasticity as steel, possesses but half the ultimate strength. There are practical reasons, however, for advocating the use of larger sheaves for steel rope than given in the above table, as, for instance, the recoil when suddenly released of tension, which might cause the rope to jump off the sheaves, but this will seldom apply to the transmission of power, and it is curious to note that iron rope is still recommended by some for this purpose. It is to be explained by the fact that objections have heretofore been urged against the use of steel on account of its lack of homogeneity, which causes it to become brittle under continuous bending, while iron, owing to its greater ductility, will simply elongate for a considerable period without having its strength seriously impaired. On the other hand, this process of elongation requires frequent taking up or re-splicing, which is very objectionable. The Trenton Iron Company is manufacturing rope of a special homogeneous grade tempered steel wire, possessing high tensile strength with great ductility, that practice has demonstrated to be superior to iron for the transmission of power, and, admitting of the use of smaller sheaves, it is to be recommended, since the saving in the cost of the sheaves will much more than offset the additional cost of the rope itself.

The angle that a wire rope makes in bending is also a matter to be taken into consideration. It has been stated that the degree of bending makes no difference; in other words, that the tension due to bending makes no difference; in other words, that the tension due to bending will be the same whether the rope merely touches the sheave or wraps all the way around it, which would be so under the assumption that the rope bends to the curvature of the sheave, but the fact is the curvature is dependent on the tension, and with certain relative proportions between the tension and bending angle, the curvature is not always the same as the sheave in contact, but something greater, which explains how it is that large ropes are frequently run around comparatively small sheaves without detriment, since it is possible to place these so close that the bending angle on each will be so small that the resulting curvature will not overstrain the wires.

NOTICES OF PUBLICATIONS.

BULLETIN OF THE UNIVERSITY OF WISCONSIN. Engineering Series. Vol. II, No. 1. Paper, 88 pp.

The first number of the second volume of the engineering series of the Bulletin of the University of Wisconsin is devoted to an exhaustive treatment of the subject of a test of modern American transformers of moderate capacities, by Arthur Hillyer Ford, B. S., Fellow in Electrical Engineering, University of Wisconsin. An introductory note is presented from the pen of Prof. Dugald C. Jackson, in which the importance of transformer economy is spoken of as the reason for the undertaking of these tests. The experiments are already well known from the abstract of the results presented before the Northwestern Electrical Association in July, 1895. Prof. Jackson says that the complete tables of the results show still more strikingly than was shown in the abstract that the cheapest transformer is not always the most economical, and that individual tests with each transformer are essential to assured economy. This investigation is believed to have had a marked effect on the manufacture of transformers for central station purposes.

THE UNIVERSAL DIRECTORY OF RAILWAY OFFICIALS, 1896.—This useful list of the names and addresses of all of the principal railway officials of the world has been revised and brought up to date, and the information which is taken from official sources should render the book a necessity in the offices of those having to do with foreign railways where the names and titles of the officers are required. The principal additions which have been made to this edition are the inclusion in the list of the Prussian State railways, and of about 150 other railways chiefly in Sweden, Spain, Cuba and the United States. The information concerning the Russian State lines has been extended, the additions occupying about 32 pages. The length of each railway, the gage, rolling stock and steam boats are included in the information. All of these add to the usefulness of this already valuable directory. The compiler is Mr. S. Richardson Blundstone, editor of the Railway Engineer. It is published by the Directory Publishing Co.. Ltd., 8 Catherine street, Strand, W. C., London, Eng. The price is 10 shillings.

BLOCK AND INTERLOCKING SIGNALS; What they are for; What they do; How they do it. By W. H. Elliott, Signal Engineer C., M. & St. P. Ry. Locomotive Engineering, New York, 1896. pp. 277; standard size 6x9. Price, $3. Flexible leather binding.

This work is written by a man in practical signal designing and maintenance work, and is intended to give a series of simple, clear explanations of the art of railroad signaling, as it is in use to-day and in which every prominent system should be covered. The illustrations are from drawings and photographs and are excellent throughout. The plan of the work is arranged to cover the entire subject in 15 chapters, which are reprinted from the pages of "Locomotive Engineering," in which publication they appeared as a connected series of articles. The first nine chapters treat of block signaling and the different automatic and manual and staff systems are fully explained, and in addition to the explanations considerable information is given with reference to the maintenance of the apparatus. In chapter VIII. the costs of operating the controlled and the simple manual systems are compared with each other and with the cost of automatic track circuit systems such as the Hall and the Westinghouse pneumatic and the staff system. Interlocking apparatus of various kinds has received attention and this part of the subject occupies about one-half of the space. The work is intended for men who are thrown in contact with signaling and yet who do not follow it as a specially. Signal engineers will find it interesting but it is not intended is any way to guide them; rather to explain ordinary features of practice. The letter press is good, the paper and binding are specially good, and those who read the book and do not expect to use it for reference may not need an index. There is none but there seems to be no satisfactory excuse not indexing a book of such a character.

"Are Diphenyliodonium and Thallium Nitrates Isomorphous"? is the title of a paper in the current issue of the Technology Quarterly. Doubtless our readers will enjoy better health for knowing that the authors pronounce that they are not ismorphous and for the sake of saving postage upon inquiries as to what di—— etc., is, it seems proper to state that it is built upon the following chemical plan $(C_6 H_5)_2$ I-OH.

PERSONAL.

Mr. Thomas A. Shaw has been appointed joint agent of the Chicago & Alton and the Union Pacific at Kansas City.

An agency for the Continental freight line has been established at Memphis, Tenn., and Mr. Joseph B. Cabell has been appointed.

Mr. O. W. Beckwith, chief train dispatcher of the Chicago division of the Big Four, has been appointed to succeed T. J. English as trainmaster of the Sandusky division.

Mr. Charles C. Black, recently assistant attorney of the Missouri Pacific, with headquarters at Atchison, has resigned and returns to Kansas City to resume the practice of law.

Mr. J. B, Kerr, a law partner of ex-Senator John C. Spooner of this city. has accepted the position of land attorney for the Northern Pacific Railroad Co., with headquarters at St. Paul.

Mr. H. W. Sparks has been appointed by the Big Four road traveling passenger agent in Northwestern territory with headquarters at Chicago, reporting to J. C. Tucker, general northern agent.

Mr. William Duncan, for many years freight traffic manager of the Baltimore & Ohio Southwestern, has been elected president of the St. Louis Cotton Compress Co., an important and lucrative position.

Mr. C. H. Schatzman now with the Pennsylvania Co. has been appointed general agent of Columbus, Hocking Valley & Toledo at Cincinnati to take effect November 1. His successor as Cincinnati Union agent, it is said, will be Mr. A. S. Machette, traveling freight agent of the Panhandle.

Mr. E. R. Bonnel, for years chief clerk for J. Q. Van Winkle, general superintendent of the Big Four, has decided to accept the position of chief train dispatcher of the Big Four's Chicago division. Mr. Frank Wilson, for some years stenographer for Mr. Van Winkle, will be promoted to chief clerk.

Mr. John Hobbs has been appointed assistant traffic and freight agent for the Santa Fe road, with headquarters in Chicago. He will have jurisdiction over the company's territory west and northwest of New Orleans. Mr. Hobbs is taken from the Santa Fe's claim department, where he has held a clerkship for several years.

Mr. Joseph Hanley has secured the appointment of agent for the Grand Trunk Railway system, and Richelieu & Ontario Navigation Co., at Kingston, Ont., port, held by his father, the late Mr. Thomas Hanley. Through being the assistant of his father for fourteen years, Mr. Henley acquired information that will make him a valuable officer.

A number of changes are reported in the force of the New Orleans & Western, among which are the following: Mr. C. B. Beason, chief engineer of the road, has resigned in favor of Mr. W. W. Tomlinson, effective at once. Mr. Tomlinson is the inventor, in a large measure, of the cotton presses in use at Port Chalmette. He is regarded as one of the best chief engineers the company has ever had. Mr. Beason will leave in a short time for his old home in Boston. Mr. W. S. Henning, general roadmaster, has also resigned. Mr. Henning's successor, has not yet been named. The next resignation of prominence is that of General Agent I. T. Preston. Mr. Preston has been the general agent of the company stationed at Port Chalmette since the road first began operation. He is to be succeeded by a Mr. Warren, who is also an old employe of the company. Mr. R. M. Seals is made assistant general agent.

RAILWAY NEWS.

Chicago & Eastern Illinois.—Tracklaying on the extension to the Chicago & Eastern Illinois is now in progress, and it is expected that the line will be completed to Shelbyville by Nov. 10. This extension, which is to be known as the Shelbyville Southern, will be about 25 miles in length, running between Shelbyville and Altamont. A steel viaduct 1,450 feet in length and over 100 feet in hight is being erected across the Kaskaskia river at Shelbyville, and this will be the largest structure of the kind in the state. Mr. N. R. Olcott is chief engineer and M. S. Carter & Co. of St. Louis are the general contractors.

Chicago, Hammond & Western.—The new belt line around the city—the Chicago, Hammond & Western—has of late been making rapid progress. The road is now open for business from Whiting, Ind., to McCook, Ill., a little over 27 miles, where it crosses the Santa Fe, and it is expected this week will see the line open to a connection with the Chicago, Burlington & Quincy. From this point—La Grange—the road has been surveyed and contracted, and work will be vigorously prosecuted until it reaches its northern terminus, somewhere between Evanston and Waukegon. Although the main object of this road is the locating of manufacturing interests on its line and the handling of through freight as a short belt connection between all western, southern and eastern roads centering in Chicago, yet a passenger department will be maintained. The branch, 12½ miles long, which is being built from Chappell to the Union Stock Yards will be completed this year. Grading and tracklaying is now about two-thirds done.

Elgin, Joilet & Eastern.—The Elgin, Joliet & Eastern road has, it is said, just purchased a large tract of land just across the state line from Hammond, Ind., on which to lay out extensive yards for switching and storing cars. For some time rumors of these negotiations have been current, but it is only recently that these rumors have been confirmed. The land lies along the right of way or the Western Indiana R., and extends from the state line to Burnham, Ill. The purchase price is said to be nearly $2,000,000, and the conveyance covers several hundred acres. It is the purpose of the company to build switch and store yards on the tract. It is rumored that a number of other roads are interested in the deal.

Illinois Central.—In its forty-sixth annual report, the Illinois Central road shows that for the year ending June 30, 1896, the number of miles of railway in operation has been increased from 2,888 to 3,127, through the lease of the St. Louis, Alton & Terre Haute Railroad, 239 miles in length, and the receipts and expenses of that railroad from October 1, 1895, to June 30, 1896, are embodied in this report. The average number of miles operated during the year was 3,067, an increase of 179 miles, or 6 20-100 per cent. This report does not include the 456 miles of railway lately belonging to the Chesapeake, Ohio & Southwestern Railroad Co. and its affiliated corporations, nor the 807 miles owned and operated by the Yazoo & Mississippi Valley Railroad Co. The following is a summary of the company's business: Gross receipts from traffic, $22,002,842.35. Expenses of operations and taxes, $14,962,275.77. Net receipts from traffic, $7,040,566.58; net receipts from sale of lands, $85,785.91; income from investments and miscellaneous profits, $1,791,177.51; income from investments in surplus dividend fund, $41,500—$1,832,677.51; total net receipts, $8,959,030. From this there have been paid: interest on funded debt, and bonds drawn under sinking fund, $2.982.808.87: rent of the Chicago, St. Louis & New Orleans R., $1,649,221.50; net rent of the Dubuque & Sioux City R., $950,463.05; net rent of the St. Louis, Alton & Terre Haute R., $290,811.15—$2,890,495.70; total fixed charges and rent, $5,873,304.57; leaving available $3,905,910.96. Of which sum your directors have by resolution set apart to provide for betterments to be made during the coming fiscal year, $422,500; and there have been taken the dividends payable March 1, 1896, 2½ per cent on $50,000,000, and Sept. 1, 1896, 2½ per cent on $52,500,000, $2,562,500—$2,985,000. The receipts from passengers have been, $4,394,771.31; an increase over the previous year of 12 45-100 per cent, or $486,423.01. The receipts from freight have been, $15,028,103.64; an increase over the previous year of 17 21-100 per cent, or $2,206,893.10; the receipts from express, mail and other sources have been $2,579,967.40; an increase over the previous year of 10 85-100 per cent, or $252,532.06. The proportion of the expenses of operation, including taxes, to the gross receipts from traffic has been 68 per cent, a decrease of 1 63-100 per cent, compared with the year preceding.

Kansas City & Southern.—The Kansas City & Southern road, 100 miles in length and running between Kansas City, Kansas, and Beaumont has been abandoned. This line was operated as a branch of the St. Louis & San Francisco system until it went into the hands of a receiver. The special master in chancery appointed by United States Judge Foster to sell the property, will probably dispose of it in a short time.

Kansas City, Shreveport & Gulf.—Through its attorneys, Puja & Moss of Lake Charles, La., the Kansas City, Shreveport & Gulf road has instituted suit for expropriation of right of way throughout that parish where the same has not been obtained. At Shreveport at a special election the taxpayers have given their consent for the road to occupy certain streets and alleys, and on the other side the road agrees to open up and dedicate to public use a street 60 feet wide, and also to grade the city park near the new depot grounds, and have given the ladies of the park association $4,000 for the dirt. This money will enable them to beautify and open up the park by next spring. The southern extension of the Kansas City, Shreveport & Gulf is now completed to Many, La., a distance of 76 miles from Shreveport. The railroad company is preparing a time card. and freight and passenger trains will be started in the course of a few weeks.

Lake Superior & Ishpeming.—A two-mile extension to this road is to be built at Ishpeming and the work of clearing the right of way has commenced. This extension will enable the Lake Superior & Ishpeming to reach Lake Angeline and the Cliff mines, and it is expected it will be finished before cold weather.

Michigan Central.—Plans for the new yards which the Michigan Central is to put in at Calumet Park show a series of stores, switch and transfer tracks, which will be operated in connection with the Pennsylvania lines, the Chicago & Calumet Terminal, and the Chicago, Hammond & Western. As now laid out the yards will extend from a point near the state line to Calumet Park, and will contain twenty tracks. These will be used to transfer freight from the various lines in and out of Chicago, and by their use the lines around the city will be relieved of the congestion of business. Close traffic arrangements will be made with the Chicago, Hammond & Western, which encircles Chicago. Work on the yards, the complete equipment of which will cost in the neighborhood of $500,000, will begin early next week, and will be completed in sixty days.

Northeastern.—This road, which is owned by the state of Georgia, is leased to E. A. Richards & Co., and on September 28, upon application of Mr. James P. Harrison of Atlanta, who claims a share of the profits from the operation of the road said to have been promised by Richards, Mr. Martin Dooly, superintendent of the road was appointed temporary receiver. On Oct. 6 the court at Atlanta denied the appointment of a permanent receiver and Mr. Dooly was discharged and the road restored to the lessees. Arrangements are said to have been made to incorporate this road into the Tennessee, Georgia & Atlantic, and extending it from Augusta, Ga., and Chattanooga, Tenn., work to begin soon.

Oregon & California.—The case of the Oregon & California R. Co. et al. against the United States, better known as the "overlap land case," has been decided adversely to the government by a majority opinion of the United States circuit court of appeals. Judge Ross rendered the opinion, concurred in by Judge Hawley, reversing the decision of Judge Gilbert of the Oregon circuit and remanding the case to the lower court with directions to dismiss it. Judge McKenna rendered a dissenting opinion, holding with Judge Gilbert that the Oregon & California R. Co. never had a legitimate claim to the land patented to it by the government under the congressional act of 1866, but that the rights of the Northern Pacific Co. still existed under the grant of 1864 because they had never been either exercised or abandoned. The land involved in the case is about 200,000 acres in the immediate vicinity of Portland, Ore. Because of the divided opinion of the four judges in the matter, the case will probably be carried to the supreme court for final hearing.

St. Louis Southwestern.—The improvements mentioned in this column two weeks as being in progress in the Big Cypress bottoms are now completed. It is said that the two miles of track through this bottom has been made as sound and substantial as any on the line and there is no fear of the company's traffic being interfered with by the winter and spring rains as heretofore. Captain Hughes, who had the contract for the grading, will move his forces to Tyler and resume work at an early date on the shop grounds. This work was a large undertaking, the track and bridges for two miles through the bottom being raised from four to seven feet.

Tacoma, Lake Park & Columbia River.—Notwithstanding all the denials which have been made to the rumors that an extension to the Tacoma, Lake Park & Columbia River R., was to be built it is still strongly believed by people in that vicinity that such a movement will materialize and that work on a line to the Tilton river coal fields will commence in the near future. Col. Wm. Bailey of New York, who is largely interested in the road, and some of his associates are now taking a trip over the proposed extension.

NEW ROADS AND PROJECTS.

California.—A company has been recently incorporated in California to construct a road called the Ventura & Ojai Valley, running from Ventura to Hobart via Nordhoff —30 miles. The incorporators are Messrs. A. P. Cross, S. R. Thorpe, J. E. Loomis, S. H. Garrett, all of Los Angeles, Cal. The capital stock is $200,000, commencing with $50,000.

Canada.—The Ontario government has granted a subsidy of $3,000 per mile, and the Dominion government a subsidy of $3,200 per mile for the construction of the Manitoulin & North Shore road and work is to begin immediately. A charter for this line was obtained in 1888 which charter was amended in 1891 and again in 1894. The route on which the charter was granted was from the town of Little Current, Manitoulin Island, Ont., northward across the islands in Georgian bay to some point on the Soo branch of the Canadian Pacific R. at or near Stanley, a distance of about 42 miles. Mr. John MacIntyre, 56 Cluck Building, Niagara Falls, N. Y., is receiving bids for the construction and equipment of this 42 miles. Directors: Peter Ryan, Toronto; W. P. Chapman, Hamilton; E. S. Townsend, Toronto; David Isaacs, Niagara Falls; R. H. Bowes, Toronto; David Phillips, Niagara Falls; John Ryan, Toronto.

Georgia.—The United States Construction Co. was recently organized at Atlanta, Ga., the general purpose of which is the building and equipping of railroads, but the specific object is to construct the Tennessee, Georgia & Atlantic Railroad, the long projected line between Augusta and Chattanooga. This proposed line will be 243 miles in length, and the Northeastern, which is owned by the state of Georgia, will form part of the line. This latter road is now leased to E. A. Richards & Co., and extends from Athens to Lula, a distance of 39 miles. A preliminary survey is being made to locate the line between Chattanooga and Lula, and a choice will be made between two lines already surveyed between Athens and Augusta. The construction company is composed principally of eastern capitalists and includes ex-Gov. A. B. Cornell, of New York; Francis M. Ferguson, H. A. Blake, of the banking firm of Blake Brothers, of New York; Judge Henry E. Knox, E. C. Machen, W. S. Witham, of Atlanta, and D. H. Livermore, W. C. Haile and E. A. Richards, also of Atlanta. Mr. Machen is a well-known railroad builder, and was formerly associated with the Chesapeake & Western line. Col. Stanton is president of the company, while John W. Weed, of New York, is secretary and treasurer, and F. S. Wallace is chief engineer. The capital stock is $3,000,000, 10 per cent of which has been paid in.

A company has been organized at Waycross, Ga., to furnish cross ties and other material for railway construction. This company has purchased 55,000 acres of fine pine timber southeast of Dupont, and has let a contract to build a road 25 miles long to connect their timber land with the main line of the Plant system. They expect to employ 1,000 hands. Large contracts have been made with the New York Central and other eastern lines for cross ties. For such roads the ties will be shipped from Savannah.

Guatemala.—A press dispatch from San Francisco says: "F. P. Schuman, a German engineer, has arrived in the city from Guatemala, where he has been employed for several months in surveying proposed routes for several new railroads. Mr. Schuman reports that matters are booming in railroading in that country. The government has surveyed a new route from Guatemala City to the Atlantic coast, in order to afford a connection and outlet for Huntington's Mexican Central, and the work of construction will begin immediately. Several other smaller lines are about to be put under way. Mr. Schuman was for five years engaged in South Africa in building the railroad from Delagoa bay to Pretoria. He is now on his way to Europe."

Maryland.—A surveying party in charge of Mr. L. H. Hyer of Washington, D. C., is locating a route for the Washington, Annapolis & Chesapeake road between Washington and Annapolis, a distance of 31 miles. Several routes are to be surveyed and the most desirable one selected. Mr. George E. Emmons is president; Mr. Thos. Smith, treasurer and Mr. A. Ritchie, secretary. Headquarters, Washington, D.C.

Mississippi.—A company called the Aberdeen & Tennessee R. Co., has been organized to build a line from Aberdeen, Monroe county, northeast through the valley of the Tombigbee river to some point on the Tennessee river in Tishomingo county, a distance of about 85 miles. It is stated that work is to begin on this line about Nov. 15, and that it will be completed to the Tennessee river within the next year. A meeting was recently held at Aberdeen at which the following officers were elected: W. C. Fitzgerald, president; R. E. Houston, vice president; John C. Wicks, secretary; J. M. Walker, treasurer. Headquarters are at Aberdeen.

Missouri.—The survey for a projected line from St. Louis, Mo., to Cincinnati and Dayton, O., has just been completed. The line surveyed runs directly northeast from St. Louis to Terre Haute, thence east through Indiana to Cynthiana, where the line divides, a north branch going to Dayton, and the south branch to Cincinnati. The Dayton division passes through Eaton, O., and touching at Richmond, Ind, runs thence southwesterly to Terre Haute, via Connersville, Rushville, Shelbyville, Franklin, Martinsville and other places. The Cincinnati branch will enter Indiana at Harrison, on the state line, and proceed thence west to Metamora, in Franklin county, and Milroy, in Rush county, and connect with the Dayton & St. Louis line at Cynthiana. Mr. E. C. Rice is chief engineer.

It is proposed to construct an electric line from Monett, Lawrence county to Sedalia, Mo. A survey will begin at once, and it is expected it will be completed by Nov. 1. Branches will run from Leesville to Butler, via Clinton, and from Leesville the road will run south to Osceola and Stockton. This road will give the Frisco a short line to Arkansas and the Indian Territory. The road will be built by Mr. Edward Wood, of Chicago, backed by New York and Boston capitalists.

Montana.—Tracklaying on the Montana R. is steadily progressing and already more than 25 miles of track is completed. From Box Canon the work will necessarily be slower until the canon is passed, but it is expected that all the rail will be laid by Nov. 15. About 250 men are in the employ of the company and contractors along the line.

Oklahoma.—The locating survey for the St. Louis & Oklahoma City R. is just completed and Mr. M. L. Lynch, chief engineer, has made his report to the directors. The line, starting at Sapulpa, I. T., at the terminus of the St. Louis & San Francisco, extends in a general southwesterly direction 109.4 miles to Oklahoma City, Ok., the terminus at the last named town. The first 41 miles from Sapulpa lies in the Creek Nation. Several tributaries of the Canadian river are here crossed, but the bridging is light, the longest span being 125 ft. There will be needed five plate-girder bridges 40 ft. long and two 50 ft. long, with short trestle approaches. The country here is well timbered and will furnish a sufficient supply of oak ties and other timber for the construction of the whole road. Building stone is also accessible. Coal of good quality is already being taken out of the mine near Sapulpa and surface indications promise coal in several other places. Natural gas in small quantities rises through the water to the surface of a creek near Kellyville. In Oklahoma the line follows the slope of the Deep Fork and North Fork of the Canadian river and runs through the town of Chandler. The land here is well suited to the cultivation of cotton. The country traversed in Oklahoma is occupied by actual settlers on nearly every quartersection, and a large proportion of the land has been brought under cultivation.

Wisconsin.—A railway is to be constructed from the east line of Green Lake county westward to the west line of Juneau county, and will be named the Chicago, Montello & Northwestern. The proposed line passes through Green Lake, Marquette, Adams and Juneau counties. The certificate of organization was filed with the secretary of state on Oct. 16. The organizers, who are also the directors for the first year, are James L. Pennifill and Alfred K. Welles of Chicago; Clarence E. Pierce of Germania, Marquette county; and Eldridge W. Underwood and Samuel W. Stimson of Montello. Each has subscribed for one share of stock, of which there are to be 20,000 of $100 each. Capital stock, $2,000,000.

Wyoming.—It is said that civil engineers of the Fremont, Elkhorn & Missouri Valley road are looking over the ground with a view to making arrangements for the extension of the Casper branch from its present terminus at Casper in Natrona county to Ogden, Utah. Report says that the Burlington & Missouri is negotiating for the purchase of the Cheyenne & Northern, and should this prove true the western connection of the Elkhorn would be cut off. This extension would be a great help to this part of the country.

INDUSTRIAL NOTES.

Cars and Locomotives.

—It is stated that the Louisville & Nashville Railway has deferred its orders for 300 gondola cars until after election. This company has let a contract to the Baldwin Locomotive Works for 15 consolidated engines to be delivered in 60 days.

—Swift & Co. has ordered from the Wells French Co., 200 more refrigerator cars in addition to those reported last week, making 400 in all.

—The Pennsylvania Co. officials have issued orders to have all idle cars put in readiness for use at a day's notice. The order is due to the improvement in freight movement. September showed an encouraging improvement over August, and the first week's ratio in October indicates a still larger increase. Last week's movement of freight cars over the Pennsylvania system, from Chicago to the east, was over 2,000 cars heavier than the preceding week. During September 73,303 loaded cars passed through the Harrisburg yards, against 62,666 in August. The officials say there will be a heavy increase in freight business after the election.

—The Manchester, Sheffield & Lincolnshire Railroad Co., of England, is having built 150 locomotives for service on its road. When these locomotives are completed it will have over 1,000 in use on 563 miles of track, besides which the company operates 22 steamboats. This includes the large ferry boats, built to carry 1,000 passengers.

—At the last meeting of the board of directors of the Bloomsburg Car Mfg. Co., Bloomsburg, Pa., a change was made, G. M. Lockard, the president, having sold his interest in the company to L. S. Wintersteen. The latter gentleman was made president. Like most concerns at present, the home demand is limited, but the works are kept busy filling orders for Japan and South America.

—It is reported from Tientsin that the bid of the Baldwin Locomotive Works to furnish engines for the new railway from Tientsin to Pekin, has been accepted against the competition of all the other great engine builders of the world. The road is a small one, but the award is highly important as a leader toward securing contracts for furnishing the great system of railroads which China is about to undertake.

—Fifty of its new locomotives and 5,000 of its new freight cars has been delivered to the Baltimore & Ohio Railroad Company.

—The contract for the Green Bay & Western cars, noted in our issue of last week, has been let to the Haskell & Barker Co., of Michigan City. This company has also contracted for two locomotives with the Dickson Locomotive Works, of Scranton, Pa.

Bridges.

—The city engineer of St. Paul has been directed to prepare plans for an iron bridge over the railway tracks at Raymond avenue in that city, estimated cost, $10,000. It is probable that the contract will be let about January 1.

—It is reported that the Western Maryland Railroad Co., is considering the question of a bridge over the Susquehanna river at Columbia, Pa.

—It is stated that the Baltimore & Ohio Railroad Co. is preparing plans for a new bridge to span Little Grave Creek at Moundsville, W. Va. The old bridge was washed out during the late storms and since that time the company has been using a temporary structure. The company will have a larger structure than the old one and it is possible that the south abutment will be extended over to the Ohio River Co's. track, who will also use it.

—It is stated that the Pennsylvania Railroad Co. will erect a double deck drawbridge across the Susquehanna river at Wrightsville, Pa.

—A meeting will be held November 6 in the office of Maj. W. S. Stanton, U. S. engineer at Watertown, N. Y., to consider the question of constructing a draw in the bridge over the Chaumont river, at Chaumont, which belongs to the Rome, Watertown & Ogdensburg Railroad Co.

—The proposition of the city of Menominee for compromise on the bridge question has been accepted by Marinette, and that city will take immediate steps to procure bids for the erection of a steel bridge to replace the old wooden structure, 692½ ft. long, to connect with Marinette's new bridge, at the center of what has been determined as the main channel of the river.

—The question of building three county bridges over the the Mahoning river in Youngstown, O., to cost a total of $150,000 will be voted upon November 3.

—In addition to appropriating $2,000 for rebuilding the Tar bridge over the Woonasquatucket river, the Providence (R. I.) council is considering the question of asking the general assembly for permission to issue $320,000 in bonds for rebuilding the Weybosset street bridge and the river walls.

—The supreme court of Connecticut has decided that a new bridge must be built on Chapel street, in New Haven.

—The New York board of street openings has passed a resolution authorizing the commissioner of street improvements in the 23d and 24th wards to build a viaduct at 153d street over the New York Central Railroad Co's. tracks. Plans are reported to be prepared for viaducts at 168th and 171st streets.

—It is reported that the board of supervisors of Van Buren county, Iowa, has voted to appropriate $20,000 for erecting a bridge over the Des Moines river between Douds and Leando.

Buildings.

—It is stated that the Oxford Lake Street Car Line of Anniston, will shortly begin the erection of machine shops in Anniston, Ala. H. G. Edwards, general manager of the company, can be addressed at Anniston.

—It is stated that the Erie Railroad Co. proposes to erect new passenger stations in Passaic, Rutherford, Middletown and Paterson, N. J.

—In order to house new machinery needed for the construction of the big bridges for which it has contracted, the Pennsylvania Steel Co. is building a large addition to its bridge shops at Steelton, Pa. The new addition will be over 100 ft. long.

—Active operations on the addition to the plant of the Howard Bullough Machine Co. at Pawtucket, R. I., have been commenced and will be vigorously pushed. The addition will be a brick building 250x60 ft., and probably three stories in hight, making an addition almost the size of the main building.

—The Grand Rapids & Indiana R.R. roundhouse at Mackinaw City, together with an engine, was destroyed by fire October 20. It will probably be rebuilt. The loss is estimated at $15,000. Rats or mice are supposed to have started the fire by gnawing matches.

—A new transfer elevator is to be built in the vicinity of the former D., G. H. & M. elevator at Grand Haven, Mich. The construction of this elevator is to begin within ten days and to be finished by December 10, with a storage capacity of 40,000 bushels. Faust, Krause & Co., of Milwaukee, is behind the construction of this elevator This company has been shipping to Ludington, but find its facilities there incomplete and wish to add Grand Haven to the list of transfer ports.

—Invitations are out for the formal opening of the Ann Arbor depot at Toledo, O. The new building will be handsomely decorated and music will be furnished by an orchestra.

—The Kansas City, Pittsburg & Gulf Co. has determined to erect not only a passenger depot, but several sheds and terminal buildings in Shreveport, La.

Iron and Steel.

—The Scranton Steel Works, of the Lackawanna Iron Company, at Scranton, Pa., which have been idle for

nearly three months has resumed operations in all departments, on orders that will keep the works on double turn for some time, giving employment to over 1,200 men.

—The Ohio Steel Company, of Youngstown, has received a large order from the McCullough Iron Company, Wilmington, Del., which it placed subject to cancellation in the event of defeat of the gold ticket. The proviso reads as follows; "We are ready to purchase steel, but are by no means confident of the result of the election, and will place a conditional order, for sheet bars for delivery in November and December, subject to cancellation by either party in case Bryan is elected." The order was booked by the Ohio Steel Company on the condition expressed.

—The Central Railway Co., of Baltimore, has given a contract for 2,000 tons of rails to the Pennsylvania Steel Co.

—The Homestead and Duquesne plants of the Carnegie Steel Company at Pittsburgh have been put in operation after an idleness of several weeks. Several thousand men were given employment.

—Application was made on October 3 to the courts for the formal discharge of the receivers for the Pottstown Iron Company, and the transfer of the property to the shareholders. Under the terms of the reorganization the unsecured creditors whose claims aggregate $800,000, will accept in payment thereof the promissory notes of the company for 50 per cent of their respective claims, and the other 50 per cent in a new issue of bonds secured by a consolidated mortgage to the Equitable Trust Company of Philadelphia as trustee. These bonds amounting to $800,000 and bearing 5 per cent interest are made payable 10 years after date, with the option on the part of the company to take them up before their maturity. Other creditors of the company whose claims amount to $190,000, are secured by $246,000 of the general mortgage bonds.

—President Moxham in the following settles once for all the various rumors and newspaper statements about Mr. Rockefeller and the Johnson Company's plant at Lorain, O.; "The original plans of the Johnson Company have never been changed since first mapped out. They were to leave the switch works and other allied interests at Johnstown, because Johnstown was, in our judgment, the best place for this class of manufacture. The manufacture of steel rails was to be conducted at Lorain, because we considered Lorain the best point in the United States for this purpose. We still consider it so, and far from regretting our move have every reason to be more than pleased with the result. Of course, until we get our blast furnaces erected we will not reap the full advantages of our location here. These will be erected as quickly as financial conditions will permit of it, and once completed we believe we will make at this point the cheapest steel made in the United States. Far from being disappointed in our location here, it has developed advantages even greater than those figured upon by us when we secured this locality for the manufacture of steel." Touching on the matter of the sale of the plant to Mr. Rockefeller, Mr. Moxham said: "I am somewhat tired of denying the rumors concerning the purchase by the Rockefeller interests of our plant. Let me say emphatically and clearly once more, the Johnson company is trying to sell its plant to nobody. No negotiations have been entered into between the Rockefeller interests and our own, and today there is no contemplation by either side of either sale or purchase."

Machinery and Tools.

—The McMullin Manufacturing Co. of Chicago intends to fully equip an entirely new shop with the most improved machine tools. Charles D. Hildebrandt has been appointed to the position of general superintendent.

—The Falk Manufacturing Co. of Milwaukee has received an order from the Thompson-Houston Co. of Paris, France, for a complete welding outfit of the pattern recently patented by the Falk Co. and which has been operated on the streets of Milwaukee in welding the rails of the car tracks together. The order from Paris stated that the machine was to be used on a line at Lyons, France, to weld 210 miles of street car track. The money consideration is estimated at $125,000.

—The Ingersoll-Sergeant Drill Co., whose offices are in the Havemeyer Building at 26 Cortlandt street, New York, has placed an air compressor in the engine room of the building, with a view of supplying air power to all tenants who may desire it. The air in this form comes from a receiver, where it stands ready for use. It is communicated in pipes to the different departments, and the Ingersoll Company operates a number of machines for exhibition purposes by it. The air can be utilized to open doors, ring call bells, work letter presses, dust furniture, and for other duties. There is no question but what the use of compressed air is in its infancy as yet in this country, and the improved appliances of the Ingersoll-Sergeant Company will do much to make it more popular.

—The Ball Engine Co., Erie, Pa., the well known builder of automatic engines for electric purposes, has recently shipped several engines to Mexico and one 200 horse power to Russia. It has an order at the present time for one 400 horse power vertical cross compound condensing engine, direct connected to Siemens-Halske Electric Co. generator, to be used for electric power in a large steel works at Marlepol, Russia.

—The Lloyd Booth Co., operating the Falcon Foundry & Machine Works, Youngstown, Ohio, has under construction a new erecting shop 60x140 feet in size, with lean to 30 feet wide, giving a floor space of 90x140 feet. The building is of brick and iron, and the iron work is being constructed by the Youngstown Bridge Co. of Youngstown, Ohio. The building will be equipped with a Shaw electric traveling crane furnished by the Industrial Works, Bay City, Mich., and a Bement, Miles & Co. planer capable of planing 10 feet square and 30 feet long. There will also be a Pond lathe with 54 inch swing by 30 feet long. There also be a full complement of smaller tools. The building is being most substantially constructed, special attention being given to light and ventilation, of which there will be an abundance. This firm has just about completed, across the street from their present location, an office building three stories in hight and most conveniently arranged. On the first floor are the general and private offices, while on the second floor are the drafting rooms and several offices; on the third floor is the blue print room There will be three vaults, giving plenty of room for storage of blue prints and other necessary records. The plant of this concern has been in operation right along and it is receiving a fair share of the business that is being placed.

—The Baltimore & Ohio Railroad Company's rolling mill at Cumberland, Md., which has been idle for some years, and which, it has been rumored, has been leased several times lately, will, it is now said, be utilized by the Baltimore & Ohio Company itself. The mill will be used as a repair shop in connection with the new machine shops, and will employ 500 men. It is the intention of the company to make all of its own engines.

—An order which the Westinghouse Machine Company recently received through its Paris branch for a 1,200 horse power engine similar to those exhibited by that company at the World's Fair, would seem to indicate that some features of the great exposition made substantial and lasting impressions of our foreign visitors. The engine is to be used in an electric lighting station in France.

Miscellaneous.

—The machinery of the municipal lighting plant at Chicago, supposed to be the largest of its kind in the world, will be set in motion on the 25th instant, when 835 brilliant arc lights will illuminate nearly every foot of the boulevards and parks included in the West Chicago system. The plant is built to supply sufficient power for 1,300 lights. Lights in the parks will be superseded by the new lights entirely. A light will be placed every 150 ft. on all the boulevards from Halsted street to Garfield park, and from Nineteenth street to North avenue, while fully as many will be placed in Humboldt, Douglas and Garfield parks.

—Superintendent Aldridge, of the New York state department of public works, has advertised for letting four pieces of work under the $9,000,000 canal improvement appropriation. The first three pieces embrace 25 miles of the Erie canal between the head of the Lockport lock and Ferry street, in Buffalo, including the commercial slip and slips 1, 2 and 3, in that city. The fourth piece provides for a waste weir and spillway at Carter sville, Monroe county. These improvements will necessitate an outlay of $1,043,000.

—The Blackmer & Post Pipe Co. of St. Louis, has been awarded the contract for 3,700 ft. of 30 in. pipe for the sewerage system of Waterloo, Ia., and the contract for 1,075 ft. of 30 in. pipe for the city of Bluffton, Ia. The sewer commissioner of St. Louis has adopted the pipe made by this firm.

—For some time past the New York Belting & Packing Co., 25 Park place, New York, has been working night and day in manufacturing its interlocking rubber tiling. Within the past two weeks it has taken orders for three prominent hotels in New York City, a well known club of Cincinnati, 32 dining and sleeping cars, one steamship and one United States battle ship. The first lot of tiling laid was in the Broad street depot of the Pennsylvania Railroad in Philadelphia, and the company advises us that after a wear of two and a half years, with an average of 50,000 people passing over it each day, a careful test with a straight edge shows that the tiling has worn down only 1-16 in., and that only in spots where nine-tenths of the walking is concentrated. They further state that nothing has been spent for repairs since the tiling was laid.

—Realizing the importance of Youngstown, O., as a railroad center, officials of the Erie are perfecting arrangements to establish a transfer station at that point to handle all the freight between New York and Chicago, introducing facilities that will insure the prompt transmission of freight.

—The Lehigh Valley annually buys about 700,000 railroad ties. Oak ties come mostly from Kentucky, and bring 62 cents apiece. The pine ones come from Florida and Georgia, and are worth 50 cents each.

—The Missouri, Kansas & Texas Railroad Co., is this week attaching one of the National electric headlights to a locomotive, with the intention of adopting them as its standard headlights if the experiment is satisfactory.

—The McMullen Woven Wire Fence Co., of Chicago, has made an arrangement with Mr. Edmund G. Fisher by which that gentleman is to handle the railway department of that firm. Mr. Fisher has in previous years been connected with the Page Woven Wire Fence Co., of Adrian, and also with Fairbanks, Morse & Co., of Chicago, as well as other prominent railway supply houses. Mr. Fisher is so well known to the railway supply business as to need no introduction by us and his wide experience and acquaintance with that business will insure to the McMullen Woven Wire Fence Co., a material extension of its already prosperous business in railway fencing.

—Many railroad officials who do not use electric headlights are of the opinion that they are of no special value on a very crooked road.

The Cincinnati, Hamilton & Dayton Railroad Company has had more experience in this respect than any other company in the world, and the following letter from General Manager Waldo gives his views:

Cincinnati, Hamilton & Dayton Ry. Co.,
General Managers' Office,
Cincinnati, O., Oct. 5, 1896.

Mr. R. C. Vilas, National Electric Headlight Co., 1427 Monadnock block, Chicago, Ill.:

Dear Sir I have your letter of October 3. A number of months ago a helping engine was returning light on our Indianapolis division from the top of the hill to Hamilton. The engineer of this engine overlooked the fact of a change in the schedule of our Chicago night express, and would have met this train on the bridge over the great Miami river in Hamilton, if he had not seen the reflection of the electric headlight on the engine of No. 36 before the train was in sight. He then stopped his engine and backed up to a siding and got into clear before the express train arrived. An engineer recently told me personally that rather than run an engine on this particular division of our road without an electric headlight, he would be willing pay for it himself.

There is no doubt in my mind but that these lights are a safeguard against accidents, and especially so on roads having many curves. Yours very truly.

C. G. Waldo, General Manager.

SHOPS OF THE RARIG ENGINEERING & EQUIPMENT COMPANY.

The accompanying illustration shows an interior view of the main building of the works of the Rarig Engineering & Equipment Company, recently completed at Columbus, O. The building is 650 ft. long, 140 ft. wide and 60 ft. high. The walls are of brick and the roof trusses of steel The latter were built by the Iron Substructure Company, of Columbus, O., and 400 tons of steel were used in their construction. The central portion of the building is 50 ft. between the columns and is commanded by two 30-ton electric traveling cranes which are carried by 20 in. T beams which may be seen in the illustration. The photograph from which this engraving was reproduced was taken at a time when the building was in course of construction. It has since that time been completed and is now well equipped with modern tools, among which is an hydraulic riveting plant, and Corliss engines, and a general line of engineering work is being turned out.